The Builder.

VOL. XXIX.—No. 1459.

Rivers: their Functions and their Treatment.

THE universal diffusion of water is necessary to existence; and perhaps no process in the great economy of nature subserves more important and useful ends. The moisture evaporated from the ocean is carried inland, and the clouds, descending in rain, "drop fatness" upon the soil. This duty done, the configuration of the surface collects the drainage water in rivulets, the primary supply for the support of animal life; and the union of the latter in the lowest valleys produces the mighty stream, which, completing the rotation, returns the water to its parent sea.

It is no uncommon figure of speech to impute to great rivers the parentage of the dwellers on their banks; and our own familiar "Father Thames" readily occurs to the mind as an instance. Nor is the epithet undeserved; for in all times the great seats of population, industry, and wealth have been placed, for the most part, on the banks of a navigable stream. To the river, the city owed its existence, its protection from danger, its supply of the first necessaries of life, its communication, and its trade. The fairest and most stately buildings adorned its banks, and the highest and noblest denizens displayed their pomp upon its waters. The parent stream was held in affection, approaching personal regard; and in ancient times the feeling of veneration thus created has even led to its deification:—

> "O Tiber, Father Tiber,
> To whom the Romans pray."

The great streams, as already stated, are formed by the union of many rivulets, and thus represent the result of the *drainage* of the entire district or watershed to which they appertain. The first function, therefore, of a river is the drainage of the land; and it is needless to dilate on the universality and importance of this duty. When, from either natural or artificial causes, it is inefficiently performed, the surface becomes moist or swampy, the atmosphere miasmatic and insalubrious, and the country more or less unfit for the habitation of man.

It has also been stated previously, that the great seats of population and trade have been usually placed upon navigable streams, to which, in fact, they owe their origin; and which form, also the earliest, and in no few instances the most important highway of a country. It follows, therefore, that the second great function of a river is to supply the means of internal navigation.

In considering, therefore, the treatment of rivers, with a view to their artificial improvement, these two functions, viz., drainage and navigation, have evidently to be kept in view; and almost all the works of river engineering have been directed to one or other, and not unfrequently to both together, of these objects.

It is proposed, accordingly, to discuss briefly in this paper the usual conditions found existing in large streams, from their point of discharge to their source; to describe the causes of impediment to the proper discharge of their functions; and the best available means whereby such difficulties may be diminished or removed.

A frequent source of impediment to the navigation of rivers arises from the formation of bars at their mouths. This most usually occurs from the circumstance that the bed of the river is composed of soft material, which the running water removes and carries down with it in suspension to the sea. Then the flow of the stream being arrested, and its silt-bearing waters brought to a stand-still, in consequence of their impingement on the sea, the material in suspension subsides or settles down at that point, and forms a bar across the entrance of the river. As the greater or less velocity of the current will determine the distance to which it is carried out to sea before its flow or motion is sufficiently checked to allow the silt to deposit, so will the distance of the bar to seaward from the mouth of the river be regulated.

The first effect of this process is naturally to shoal the water or form a bar at the entrance of a navigable river, to an extent generally limited by the circumstance that the river water must at all times force its passage over or through the bar into the sea. Nor are the impediments to navigation always confined to such shoaling alone. When the mouth of the river is in an exposed situation, the bar is liable to become, as it were, an artificial foreshore, over which breakers are formed and roll with violence; and the depth of water on the bar is then further diminished by the extent to which the trough of the wave descends below the level of the smooth water. The surface of the water will, in such a case, frequently pass with great rapidity from a state of quiescence to one of agitation, and remain so for a lengthened period; detaining vessels, in many instances, for weeks together, from the impossibility of their crossing the bar with safety. In fact, many frightful shipwrecks have occurred in attempting such a passage with an insufficient depth of water to keep the vessel afloat at the lowest level; the ship being alternately lifted on the crest of the waves and lowered in their trough till her bottom strikes on the bar, when the pounding motion thus produced on the heavy mass of her hull almost instantly breaks her to pieces.

It has been stated that the diminution of the depth of water over a bar is generally limited by the circumstance that the river-current must at all times force its passage either *over* or *through* the bar into the sea. The former of these conditions usually occurs and continues whilst the river waters are at their average volume and normal state; when the tendency of the bar is to shoal to the utmost limit, at the same time increasing its width or transverse section from the continual accumulation of deposit. The latter condition, on the other hand, takes place at the period of heavy floods, when the increased velocity and volume of the current tends to sweep away the previous accumulation and to remove the material of the bar further out into the deep sea water. The force of floods, therefore, when thus available, is the most potent agent for keeping open the navigation; and the usual object of engineering works in such a case is to confine the force of the flood within artificial boundaries or limits, and to direct or discharge it fully upon the bar; when from the expansion of the river-current or otherwise, that effect did not previously take place.

When the object of works of this nature is to remove an existing bar, they usually consist of two embankments or walls in continuation of the natural banks of the river, carried out seaward to such a distance as to prevent the diffusion of the flood water, and the consequent diminution of its force, before it impinges upon the bar. Perhaps one of the most interesting examples of works of this nature, which have been recently constructed, is that from the designs of Sir Charles Hartley, for maintaining a navigable depth through the bar of the Sulina mouth of the Danube, the particulars of which it is now proposed briefly to describe.

The shore of the Black Sea, at the point where the Sulina mouth of the Danube discharges into it, lies nearly north and south, and a littoral current of about a knot an hour, flows from north to south along the coast. There are no tides in the Black Sea, but the level of the water along the shore is considerably influenced by the action of the wind, varying from 18 in. below the mean sea level when the wind is from the west, or off the land, to 2 ft. above that level when the wind is from the east, or off the sea. The Sulina branch of the Danube discharges at right angles into the sea, its navigable width being about 300 ft., and it discharges a quantity of water, varying from 4½ million cubic feet per minute during times of greatest flood, to a little over half a million cubic feet per minute during the dry season. The amount of deposit held in suspension by the river water during these times (from which deposits the bar is formed) varies from about 1 in. in the foot, or 1-12th during the floods, to about one-fortieth during the dry season, of the cubic quantity of water in the river.

The phenomena of the formation of the bars are sufficiently curious. In ordinary seasons, the matter held in suspension by the river waters is precipitated near the shore, at a short distance seaward from the mouth of the river; and this effect, frequently continuing for months together, forms a regularly increasing bar across the entrance. At the time of high floods, however, the river waters having a greatly increased volume and velocity, force their way through the bar further out into the sea, removing it either wholly or partially into deeper water, and leaving the river entrance comparatively free from obstruction. But the flood waters themselves, which carry a greater quantity of matter in suspension, form bars in their turn farther from the shore, as well as of considerably greater magnitude. Also, if the flood be accompanied by a westerly wind coinciding in direction with it, and lowering the sea-level as already described, this bar will be formed still further out to sea, owing to the greater penetration of the river waters; while, on the other hand, if the wind be eastward, or contrary to the flow of the river, the level of the sea is raised as above mentioned, the velocity of the flood waters is more effectually checked, and the deposit of the matter in suspension takes place more rapidly, resulting in the formation of a bar nearer to the shore, and of greater magnitude than in the former case. On the subsidence of the flood, these deep-water bars are gradually lessened, or partially removed, by the littoral current, and the formation of bars near the shore from the ordinary river waters proceeds as before, until another flood again sweeps them out to sea.

It will be readily understood from this description, however, that the whole mass of the deposited material at the river mouth is continually on the increase, even though a navigable passage through it may be maintained either by natural or artificial means. The result is, in fact, a constant encroachment of the land upon the sea; and the delta of the River Danube, which discharges through no less than eleven mouths into the sea, has attained the dimensions of about forty miles from east to west, and about fifty miles from north to south; and covers an area of considerably more than a thousand square miles.

The system of improvement of the Sulina

Fires.—A fire broke out in the old parish church of Ayr, on Sunday last, a little before the commencement of the afternoon service. The fire, which originated in the chimney in connexion with the stove (of course) of the church, immediately spread to that portion of the roof which covers the Merchants' Gallery. The new fire-engine and brigade were soon on the spot, but the hose being out of order, the water had to be carried to the roof in buckets. The fire, however, was soon extinguished, but not before a considerable part of the roof was destroyed.——At a late hour on Wednesday night before last a fire, which at one time threatened the loss of a great deal of property, broke out in the Masonic Hall, adjoining and belonging to the Essex Arms Hotel, Watford. The fire-engine belonging to the Watford fire-brigade was quickly on the spot, but owing to some mismanagement no water could be procured for nearly an hour. After about three hours' hard pumping the fire was subdued. The Corn Exchange is also much damaged. The damage is estimated at 1,500*l.*

The Covered Market for York.—The York City Council have once more appointed a committee to report as to the best site for a covered market. In coming to any conclusion on this important consideration, remarks the local *Herald*, we trust the committee will not lose sight of the fact that York is an important city, which can boast of many public buildings worthy of its ancient fame, and that a small, cheap market, without any architectural decoration, would not only tend to lower it in public estimation, but be out of character with the works of former generations. The scheme which was withdrawn last year was estimated to cost some 40,000*l.*, but this included a splendid range of public offices, the rent of which would have paid the interest for the outlay. The idea of public offices and covered market combined now seems to have been abandoned, and a general feeling exists that an expenditure of from 20,000*l.* to 25,000*l.* will secure a covered market sufficient for all the present wants of the city.

Mode of Disposing of Snow.—The parochial authorities of St. Giles and St. George's, Bloomsbury, have introduced a mode for disposing of the accumulated snow. In New Oxford-street the snow was piled in heaps close to the gully-holes of the sewers. A large cask with the bottom knocked out having been placed over the grating of the gully, it was filled with snow, and to the cask was attached the waste-pipe of a steam fire-engine, and the steam was made to play upon the snow until it gradually melted and ran into the sewers. Years ago the City Commissioners of Sewers offered three premiums for the best plan to rid our streets of snow: have they awarded them yet?

The Alexandra Park and Palace.—The Wood-green Committee for promoting the opening of this establishment on the plan proposed by Mr. Fuller, have awarded the prizes for the essays on this subject as follows:—The 1st prize to Mr. R. Glover, jun., Surinam House, Stratford, Essex; and the 2nd to Miss M. A. Morel, daughter of the Rev. M. Morel, the Vicarage, Wallingford, Berks.

Gift of Church Bells.—Miss Burdett Coutts signified her intention, some time ago, of presenting a new peal of six bells to the town of Boroughbridge, in remembrance of her father, Sir Francis Burdett, representing that town in Parliament. On Thursday, the 5th inst., the bells were formally received by the inhabitants, and conveyed to the church. There was an immense gathering.

Cathedral of Bois le Duc.—The architects who are engaged in the restoration of the Cathedral of Bois le Duc, or S'Hertogen Bosch, as the Dutch call it, are Messrs. Hesseman & Venneman. The names are not quite correctly printed in the notice of this building given in our last issue.

TENDERS.

For new offices, opposite Terminus, Caterham, Surrey, for Mr. R. Martin. Quantities supplied by Mr. Fredk. Sparrow:—

Smethurst	£1,110 0 0
Hearle	1,087 0 0
Turner & Son	1,032 0 0
Jarrett	1,012 0 0
Langmead & Way	970 0 0
Ward	965 0 0

For passenger-station at Pembroke, on the Pembroke and Tenby Railway. Messrs. Szlumper & Aldwinckle, architects:—

Thomas, G.	£480 0 0
Thomas, T.	447 10 0
Barrett	439 19 0
Jones & Johns	395 0 0
Phillips & Hughes (accepted)	389 0 0

For day-schools, Fish-street Congregational Church, Hull. Mr. S. Musgrave, architect:—

Hockney & Leggins	£1,800 0 0
Brown	1,733 0 0
Musgrave	1,730 0 0
Foster	1,724 0 0
Raven	1,708 10 0
Barrett	1,696 0 0

For boys' schools in connexion with St. Paul's Church, Hull. Mr. Musgrave, architect:—

Fewster	£1,287 10 0
Raven	1,276 11 6
Schofield & Co.	1,276 4 0
Sergeant	1,265 10 0
Haswell	1,235 10 0
Foster	1,205 0 0
Barrett	1,172 0 0
Hockney & Co.	1,170 0 0
Evington & Wharran	1,164 7 6

For Lambeth new Workhouse, Kennington, Surrey, for the parish of Lambeth. Messrs. R. Parris and T. W. Aldwinckle, architects. Quantities supplied by Mr. T. Nixon:—

Brass & Son	£52,590 0 0
Wilson	49,500 0 0
Gammon & Son	48,457 0 0
Eaton & Chapman	47,738 0 0
Myers & Sons	47,672 0 0
Wright, Brothers, & Goodchild	47,500 0 0
Mann	47,465 0 0
Yates	47,356 0 0
Lathey, Brothers	47,353 0 0
Garrud	47,291 0 0
Dickinson & Oliver	47,100 0 0
Howard	46,740 0 0
Cook & Green	46,439 0 0
Waterson & Co.	46,420 0 0
Crabb & Vaughan	46,300 0 0
Markwick & Thurgood	46,000 0 0
Wood	46,000 0 0
Rider	45,918 0 0
Hart	45,700 0 0
Lacey	45,500 0 0
Manley & Rogers	45,467 0 0
Brown	45,300 0 0
Nightingale	45,218 0 0
Perry & Co.	44,990 0 0
Downs	44,980 0 0
Hill, Keddell, & Waldram	44,600 0 0
Crockett	43,390 0 0
Henshaw	42,784 0 0

For the erection of a five-storied warehouse on the Charterhouse Estate. Mr. John Collier, architect:—

Johnson	£3,773 0 0
Gammon	3,429 0 0
Rivett	3,292 0 0
Perry, Brothers	3,280 0 0
Moore & Grainger	3,279 16 0
Thorn & Co.	3,050 0 0
Nightingale	2,943 0 0
Mortar	2,793 0 0
Hart	2,780 0 0
Henshaw	2,738 0 0
Crabb & Vaughan (accepted)	2,693 0 0

TO CORRESPONDENTS.

Mr. Brassey.—We have yielded our intention to publish a portrait of this gentleman, at the express wish of a member of his family.

Bradford.—We are asked to mention that the notice of Improvements in Bradford, Yorkshire, which we quoted in our last as from the *Bradford Observer*, appeared originally in the *Leeds Mercury*

W. G. S.—H. S.—T. W. A.—E. W. J.—W.—W. G.—A. H.—D. M.—S. H.—A. B.—T. P.—M. W.—T. H.—E. W.—C., P., & Co.—J. C.—T. N.—W. F.—H. C.—R. P.—J. F.—J. C.—W. C.—C. J.—P. A.—L. T.—A. J.—S. P.—C. L. E.—S. M.—J. L.—C. C. H.—G. T.—N. & Son.—H. H. S.—M. A. E.—C. E. O.—W. L. (answer has been sent),

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of Tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

[ADVERTISEMENT]

BUENOS AYRES GOVERNMENT CERTIFICATE.—TRANSLATION.—"We, the undersigned, at the request of Messrs. James C. Thompson & Co., certify that the IRON SAFES of Messrs. CHUBB & SON, London, of which these gentlemen are Agents, were exposed for several hours to the Fire that took place in the Offices of the National Government on the evening of the 26th instant; that in our presence they were easily opened with their respective keys; that the moneys and important documents they contained were found in perfect order; and that these Safes are now in use in the National Treasury Office.—Buenos Ayres, July 31st, 1867.

(Signed) J. M. DRAGO,
Treasurer of the National Government.
JOSE TOMAS ROJO.
JUAN M. ALVAREZ.

A true Copy.—A. M. BELL."

A large assortment of these SAFES may be inspected, and lists of prices obtained, at CHUBB & SON'S, 57, St. Paul's Churchyard, London; 68, Cross-street, Manchester; 28, Lord-street, Liverpool; and Horsley-fields, Wolverhampton.

J. L. BACON & CO.
MANUFACTURERS OF
IMPROVED HOT-WATER APPARATUS,
FOR WARMING AND VENTILATING
Private Houses, Churches, Schools, Hospitals, Manufactories, Greenhouses, &c.
OFFICES AND SHOW ROOMS,
FARRINGDON-ROAD, LONDON, E.C.
ONE DOOR FROM RAY-STREET.
Publishers of a Pamphlet on "Hot-Water Heating."

Lately published, royal 4to. ornamental cloth, price 1*l.* 16*s.*
ENGLISH COUNTRY HOUSES.
FORTY-FIVE VIEWS and PLANS of recently-erected Mansions, Private Residences, Parsonage-houses, Farm-houses, Lodges, and Cottages; with the Actual Cost of each, and a PRACTICAL TREATISE on HOUSE-BUILDING.
By WILLIAM WILKINSON, Architect, Oxford.
Oxford and London: JAMES PARKER & CO.

THE QUARTERLY REVIEW, No. 259,
is published THIS DAY.
CONTENTS.
I. OUR NATIONAL DEFENCES.
II. MODERN WHIST.
III. COUNT BISMARCK, PRUSSIA, AND PAN-TEUTONISM.
IV. REVENUES OF INDIA.
V. INVASION OF FRANCE.
VI. THE IRISH LORD CHANCELLORS.
VII. CATHEDRAL LIFE AND WORK.
VIII. FRENCH PATRIOTIC SONGS.
IX. POLITICAL LESSONS OF THE WAR.
JOHN MURRAY, Albemarle-street.

THE QUEEN, the Lady's Newspaper and Court Chronicle, an Illustrated Journal, contains every week: Leaders on all topics interesting to English women—Critical Notices of all the New Music; the London Theatres—Designs and Descriptions of all New Work, both useful and ornamental, profusely illustrated—Every kind of interesting Amusement and New Games fully described—Occasional Articles by eminent Gardeners on Plants and Flowers—Fashion Plates of the Newest Fashions given once a month—Coloured Work Patterns given once a month—Cut Paper Patterns given once a month—Supplements of some kind or other given every week—Full Description from "Our Own Correspondent" of Besieged Paris—The Doings of the Court—Reviews of New Books—Music and the Drama fully Reviewed and Noticed—Housekeeping in all its branches fully treated of—Notes and Questions in all the above departments answered by Correspondents.
Copy for Six Stamps.
London: "Queen" Office, 346, Strand, W.C.
N.B.—On Saturday, 7th January, begins the New Volume, the Forty-ninth (49th) published.

SPORT in BRAZIL; a Visit to the Pyrenees; The Sinai Desert, and How to see It; Prevention of Foot and Mouth Disease; and ably-written and exhaustive Articles upon Subjects coming under the subscribed heads:—Shooting, The Country House, Croquet, Travel, Hunting, The Naturalist, Falconry, Angling, Canoes and Canoeing, Yachting, Rowing, Cards, Chess, The Turf, Athletic Sports, Billiards, Coursing, Golf, Football, The Garden, The Farm, Poultry and Pigeons, The Markets, Full Reports on all Shows, Sporting Meetings, &c., and Leaders upon subjects of moment interesting to, or affecting the interests of, the Country Gentleman, either as a Sportsman and Naturalist, or as a Farmer, &c.
See THE FIELD, the COUNTRY GENTLEMAN'S NEWSPAPER, for 7th of JANUARY. Specimen copy post free for Six Stamps.
London: "Field" Office, 346, Strand, W.C.
N.B.—With this number commences the new volume, the Thirty seventh (37th) published.

PERFECTION in BOOKKEEPING.—BUILDERS and Others desiring a really good system, can have a set of MODELS for BUILDERS' BOOKS, by DOUBLE ENTRY, to which was awarded the prize offered in "The Builder," No. 1,180, and which has been adopted by many large firms. Also a Modified Arrangement by Single Entry, suitable for small builders.—Address, E. A. 4, St. George's-road, Regent's Park, London.

CIVIL ENGINEER'S PRICE BOOK, 1871.
Now ready, demy 8vo. with Three Plates and numerous Woodcuts, cloth, price 6*s.*; postage 5*d.*
THE CIVIL ENGINEER'S and CONTRACTOR'S ESTIMATE and PRICE BOOK (Atchley) for 1871, with Specifications for Permanent Way, for Telegraph Materials, and for Works, Plant, Maintenance, and Working of a Railway; and an Alphabetical Priced List of Machinery, Plant, Tools, and Fittings required by the Contractor in the Execution of Public Works.
By W. DAVIS HASKOLL, C.E.
London: LOCKWOOD & CO. 7, Stationers' Hall-court, E.C.

Now ready,
WEALE'S ENGINEER'S ARCHITECT'S, and CONTRACTOR'S POCKET-BOOK for 1871. With Eight Copper Plates, roan tuck, gilt edges, 6*s.*; postage, 4*d.*
"We have often found it great saving of time, and always correct when consulted."—*English Mechanic.*
"Every branch of engineering is treated of, and facts, figures, and data of every kind abound."—*Mechanics' Magazine.*

WEALE'S BUILDER'S and CONTRACTOR'S PRICE BOOK for 1871. Originally edited by the late G. R. BURNELL, Esq. C.E. 12mo cloth, 4*s.*; postage 4*d.*
"Well done and reliable."—*English Mechanic.*
"It offers at a glance a ready method of preparing an estimate or specification, on a basis that is unquestionable."—*Engineer.*
London: LOCKWOOD & CO. 7, Stationers' Hall-court, E.C.

PROPOSED NEW LONDON RAILWAYS, &c.
Just published. Scale, 2 inches to a Mile; Size, 40 inches by 27.
STANFORD'S NEW MAP of PROPOSED METROPOLITAN RAILWAYS, TRAMWAYS, and Miscellaneous IMPROVEMENTS, for Session 1871, showing also the Sanctioned Lines and Railways in Operation, with a List of the Plans numbered to correspond with the Map and the Private Bill Office List; the Names of the Engineers; and the Lengths of the Proposed Lines. The Tramways Sanctioned and Proposed are printed in Blue; the Railways, &c. in Red.
Price in Sheet, 2*s.* 6*d.*; Mounted in Case, 5*s.*
London: EDWARD STANFORD, 6 and 7, Charing Cross, S.W.

Just published, crown 8vo 208 pp. cloth, price 5*s.*
SIGN WRITING and GLASS EMBOSSING: a complete Practical Illustrated Manual of the Art.
By JAMES CALLINGHAM.
London: SIMPKIN, MARSHALL, & CO. Stationers'-hall-court; and BRODIE & MIDDLETON, Artists' Colourmen, 79, Long Acre.

"WORKING PEOPLE and IMPROVED HOMES."
The new and illustrated edition of "The Dwellings of the Labouring Classes," by HENRY ROBERTS, Esq. F.S.A. (author of "Home Reform," and "The Physical Condition of the Labouring Classes") will be found a summary of the efforts at home and abroad to secure "Healthy Homes" for working men and women.
"A most valuable handbook."—*Builder.*
To be had at the Office of the Society for Improving the Condition of the Labouring Classes, 21, Exeter Hall, Strand. Price 7*s.* Also Designs for Cottages, numbered on sheet, with Specifications, &c.

entrance recently adopted by the European Commission of the Danube is described by the engineer as being that of guiding "the river waters across the bar, by means of piers projected from the most advanced dry angles of the mouth; or, in other words, that of concentrating the strength of the river current on the bottom of the proposed seaward channel, by an artificial prolongation of the river banks into deep water." For this purpose, two piers were built out into the sea in continuation of the river banks, the northern pier being 4,631 ft. in length, and the southern pier 3,000 ft.; the formation of the shore allowing the south pier to be commenced at a considerable distance seaward of the shore end of the north pier, and the latter also projecting out somewhat further. These works had naturally the effect of concentrating the river current, and directing its whole force on the existing bar; and they have been carried out to such good purpose, that the navigable depth has been increased from 9 ft. to 17 ft., to the immense improvement of the navigation, and consequently of the trade of the locality.

It may be understood that in works of the above nature the effect is but temporary, as the deposit of silt ever continues, and that in a period of time varying according to the circumstances of the case, a further prolongation of the piers will become necessary; and this applies to all rivers carrying matter in suspension to the sea.

The above effects are considerably modified where a river discharges into a tidal sea. In this case, the river waters, instead of descending with a regular flow, are penned back, and rendered stationary, by the rising or flood tide, and are therefore liable during its continuance to deposit the matters held by them in suspension in the upper reaches of the river, instead of at its mouth. In general, however, the entrance of such a river is kept comparatively open by the tidal scour, especially when the ebb tide, uniting with the fresh waters, creates a strong downward current. Such a current is also less liable to be brought to a standstill by impinging on the sea; as, instead of being arrested by the salt water, it continues its flow in conjunction with the retreating tide, to which its waters are united.

The above, however, though the most common, are not the only cause of the formation of bars. It also frequently happens that deposits are formed at the mouths of rivers by tidal silt-bearing waters which are checked in their regular flow at that point. The Thames is a notable example of this effect. The flowing tide runs along our eastern coast in a southerly direction from the north of Scotland to Essex, and the flowing tide through the English Channel runs at the same time in an easterly direction to beyond Dover, and, turning northward from this point, it meets the northern flow above mentioned.

These opposing currents arrest each other's velocity opposite the mouth of the Thames, and enormous deposits in consequence take place in the estuary into which the river discharges, though, fortunately for the navigation, the scour created by the tidal waters passing into and out of the Thames itself is sufficient to keep open several navigable channels at its mouth, where sufficient depth of water for the largest vessels is constantly maintained.

Again, in the Dornock Frith, which is the most northern estuary on the east coast of Scotland, there is a remarkable example of the formation of a bar by tidal waters. The mouth or outlet of the frith forms a semicircular bay of considerable extent, the diameter of which is open to the sea; but at the upper end or head of the semicircle, the prolongation of the frith is contracted abruptly to about one-fourth of that diameter, and it continues its course inland with that dimished width. The consequence is that the flowing tide from the open sea is guided along either shore of the semicircular bay till it gradually forms two littoral currents, which meet each other in opposite directions at the head of the bay, opposite the point where the frith is suddenly narrowed, as above explained. These littoral currents, thus meeting from opposite directions, bring each other to a comparative standstill opposite the point where the upper or narrow portion of the frith discharges into the bay, where they deposit the silt which they carry in suspension. Thus the curious effect is produced of the formation of a bar opposite the mouth of the upper portion of the firth, but which is formed from the deposit of silt by the external waters of the sea instead of by the internal waters of the river.

This effect, of course, ceases on the commencement of the ebb tide, when the current is turned in the opposite direction. The tendency of the ebb is to remove the newly-formed bar; but as there is only the water contained in the upper or narrow part of the estuary available for this purpose, which is considerably less in quantity than the flood setting in through the bay, the bar permanently continues. It is found, moreover, that the depth of water over the bar is greatest after the occurrence of heavy land-floods acting in conjunction with the ebb-tide.

A bar is also formed in the same locality, but from a different cause, at the sea entrance to Cromarty Frith, immediately south of the Frith of Dornoch, just referred to. This entrance consists of a narrow chasm between two lofty headlands, of about a mile and a half in length. On the landward side of the entrance the frith suddenly expands into a bay of several miles in extent. The tidal waters, in consequence, rush through the narrow passage with great velocity, and deposit their silt on either side of it when their velocity is checked. The flood-tide deposits its silt in the inner bay, and especially around its shores, where the velocity of the current is the least; and the ebb-tide deposits its silt at a short distance to seaward of the mouth of the narrow passage, forming a bar in a manner precisely similar to that of a silt-bearing river. In the latter case, the fact is observed, that the greatest amount of bar, and consequently the least depth of water over the bar, is found in the direction which is taken by the main current of the ebb-tide; the quantity of silt carried by the ebb being, of course, the greatest in that direction.

The effect of the tidal waters in maintaining a navigable channel, either over a bar or through the deposits in the lower reaches of a river or estuary, is, in the majority of instances, of far greater importance than the effect of the river waters themselves. Any engineering works, therefore, in such a locality, whereby the tidal scour may be effected, usually require the most careful consideration; and in the case of projected works in this country are made the subject of minute investigation by the public authorities.

Such works have generally one of the following objects in view, namely, to improve the navigation, to form lines of wharfs or quays, or to reclaim for cultivation the lands lying on the foreshore of the river or estuary, which were previously submerged at high water.

For maintaining the navigation, it is usually advisable to admit the greatest possible quantity of tidal water into the river. The reason of this is manifest. As the river approaches the sea, its inclination diminishes, until it becomes nearly or entirely horizontal, and the velocity of the upland waters is diminished in proportion. This causes them to deposit their sediment, and to diminish the depth for navigation. But the tidal waters, by creating what may be termed an artificial current, correct this tendency and keep the channel clear, and the larger the body of tidal water admitted into the river, the more effectually this duty is performed.

Though, however, it may be assumed as a rule that the larger the quantity of tidal water the better, yet this rule may admit of some exceptions. For instance, if any portion of a river subject to tidal influence be expanded to a considerable width, so as to form a sort of lake at that part, the tide during its flow will be partially occupied in filling this expanse, and proportionately prevented from rising or flowing into the portion of the river immediately above, which is thus deprived of the full advantage of the tidal scour. In such cases it may be more advisable to contract artificially the channel of the river to its normal dimensions, even though the capacity for receiving tidal water should be somewhat diminished. In short, the benefit of the tidal influence is measured, in one sense, by the cubical quantity of tidal water which the river receives; and, in another, by the height or distance up the river to which the tide ascends, and the balance of greatest advantage is arrived at when due regard is paid to both considerations, either of which may predominate according to local circumstances and requirements.

We will treat further on this subject in our next.

Royal Academy. — Mr. Edward William Frost has at last been elected R.A.

ART-WORKMEN'S EXHIBITIONS AND NATIONAL ART.

IF there be one thing more than another which would appear to be characteristic of the present age, it is the earnest, nay, passionate desire which seems to pervade all civilised nations to gather themselves together into single, great, and distinctive groups, bound together by the sole tie almost of *language*. Thus America, North and South, after a tremendous struggle and cost, have become one, under one head or centre of rule; and Germany is now about to consolidate itself into an empire, also under one head and centre of general regulation. Indeed, it would seem to be a kind of modern civilised mania thus to centralise and bind together those speaking the same language, as German, or Italian, or English. It is certainly a grand and captivating idea, and it is no wonder that the public mind of the world takes to it, and sacrifices a good deal to practically realise it; but, like every other good thing, it has its disadvantages as well as its advantages. Without dwelling for a moment on the grandeur and good to be got out of such a state of things, and on such a division and distribution of the civilised world, we may be allowed, perhaps, to say a word on one or two of the disadvantages inherent, as it would seem, in such a state, and more particularly as regards the working portion of the community.

Again, and it is a subject which has hardly received the attention which it so well deserves, what a curious thing it is that nations should have what we may term "artistic periods," or eras, times in which they seem to put forth all their artistic strength and power, and to concentrate into a few years the whole art power which is in them, as in the time of Michelangelo, Raffaelle, and Leonardo. There never was before nor since such a time for *painting*; it all seemed to concentrate itself into a few years of fleeting existence, and then to die out without possibility of renewal. Why is this? and why should art flourish at one time and not at another? What was there in the times of those giants of painting more than at this hour, that should have made them what they were, and that there should be absolutely nothing now to succeed them? Can any one offer any theory of explanation? Art power never entirely dies out; there is always a natural supply of it, always ready for its special work, provided only circumstances are favourable to its real and healthy action, and opportunities offer for its profitable production. We think we can see a cause for this, at least a partial one, but for the present we put the fact before the reader to help him to look into our present subject with more clearness. There is yet one other subject perhaps more to the purpose than either of the two we have named, important and vital as they are; and it is this,—the feeling there is, or rather mania we might call it, to teach *other* nations *our* own ways and modes of work; or, in other words, to "civilise" them, as it is called. Vast sums of money are actually annually collected for the purpose of almost compelling other countries, such as India, the vast peninsula, almost a continent, of Hindostan, to accept our institutions, and literature, and art manufactures, and, as far as can be, language itself. We seem to feel a sort of morbid pity for the poor Hindoo, and to fancy that all he wants is to be made as English as possible, and as unlike his own natural self as can be. There are those who, had they but their own way, would destroy all his architecture, his temples, his cities, his modes of work, manufactures, and everything else, language included, and make a genuine Englishman of him. Happily this is impossible; but if it were possible, would it be wise to do it? There can be no little doubt that in the original thought and constitution of the world, it was intended, not that *progress* or "civilisation," as it is called, should assume one uniform type and likeness, but that there should be in the very nature of things a vast number of such types, varying in each time and country, and each one capable in itself, if left alone, of expanding into new and untried forms, peculiar to itself, and unlike anything else. Is it well, therefore, artistically considered, to civilise or fill with our art-manufactures the whole wide extent of India? Surely it cannot be. The effect of it must be in the end, and if perfectly successful, to fairly blot out one of the great inventive ideas of nature herself. Nothing can be more original, whatever its art worth, than the art and architecture of the Hindoo, and we are told on

all hands that his language, the Sanscrit, is the first and greatest in the world, far surpassing even the Greek itself. We have been led to these thoughts from some profound cogitations on the late exhibition of working men's productions at the Agricultural Hall. This exhibition was, without doubt, a remarkable one, and full of the deepest interest, and in it there was concentrated as much of the spirit of modernism as there well could be. It was not confined to things produced in this country, but contained something from nearly all others; indeed, it epitomised the working world as far as it went, and as it now exists. It professed to be, as all know, an exhibition of the productions, not of the master tradesmen of the world, but of their *workmen*, the artist-workmen of the time. What it all proved it would be impossible in our few words to indicate, but one thing at least it visibly showed, viz. this,—that other countries seem to be at present in the same state of *transition* as respects art as we ourselves are. Did any one observe it, but it struck us as a most disheartening thing, that there was no one genuine specimen of *indigenous* art in the whole building; nothing was purely and solely "national" in its origin; nothing seemed to come solely from the place it belonged to, but to be compounded of different elements, got together no one can tell how, with but the original stock existing only as a kind of foundation or block on which to work? Let us name one or two things only by way of example,—truly melancholy things to look at, and to think over. Spain is at present going through a most curious phase of national existence; she is following the poor and truly pitiful instinct of the passing hour, and is getting together a *foreign* element of progress. Some workman from Spain,—from Saragossa, we think it was,—spent three years and a half, so the card on it said, in putting together, and carving in the most elaborate way, a small pianoforte, copied, as it would appear, from some cheap instrument by some inferior maker here. This piece of mechanism was carved, as we have said, in the most profuse and elaborate way, on every part of it; there was no space left uncarved, and it was all carefully and almost painfully done, and took the man who carved it years to accomplish. But what was it that this painstaking man covered his pianoforte with? Simply, a copy of arcading and wall-surface decoration from the Palace of the Alhambra, as far as he could make it out. Most people know what the Alhambra is, and how it is decorated, both from the well-known book of Mr. Owen Jones, and from his reproduction of a part of it at the Crystal Palace. It was from this that all the ornament and carving was taken, but, of course, reduced down to the scale of a bit of furniture. It was a truly pitiable waste of painstaking labour, and what struck us more particularly in it was the fact of its being all *copied* work, and nothing else, the workman evidently not knowing what it was that he was copying or reproducing, or what it all meant. How it would have surprised him to see a genuine piece of furniture out of the old Alhambra Palace in the days of its prime, when it was a living reality, and peopled with the human beings who built it. Some little idea may be got of this from Mr. Lane's book on the "Modern Egyptians," and from one or two specimens of Arab furniture at South Kensington. A table, or a fountain, or a stool, in the days of the Alhambra, was as unlike the room in which they were to be placed, as those things are unlike each other nowadays; and we mention this production to show how completely *continental* Europe is at sea in such matters, as well as ourselves. This ingenious man would never have thought of doing what he did but from the startling fact of his not knowing what else to do. He had no idea how to decorate a piece of furniture otherwise than from forms got from the *walls* of a palace; and no modern Spanish palace wall affording him anything to go by, he must needs go back in time, and away from his country almost, and fly to the Arab, once his master, for an idea; and then having got one, was utterly blind to the right use to be made of it! Let us repeat it,—it took three whole years and a half of this good man's life to work out this poor notion. We have mentioned this Spanish production more especially from the fact of the comparative *insular* position of Spain, and from a sort of hope we always had that something *original* might come out of Spain consequent on her insular state, and from the fact of her being, as we are told, "behind the world" a little. To be behind the world in these days means that of not being thoroughly, or not at all, in the active production of art-manufacture and art-producing machinery, but the being compelled, through the absence of those, to adhere to the old-fashioned system of *hand work*; or, in other words, of real art-production. May there not yet be in the interior parts of Spain some genuine art? And if there be, by head and hand, such work, what is it like, and what style is it in? What sort of work is the rough cottage furniture, and what the pattern or ornament, or the rough clothing worn by the common people in the wild mountain hollows of Spain, and in the out-of-the-way small towns where the people are too poor to buy foreign goods, and are obliged to manufacture by hand their own? Is the style of it Gothic, Renaissance, or Moorish, or more primitive than either?

We have no intention of going all through the late Exhibition, but only to draw out one or two thoughts from it; so shall but mention one other section of it,—the "Indian," as it was termed. This was more dismal of the two than the Spanish; for one always expects some genuine and characteristic work from entirely out-of-the way and foreign sources like Delhi, or Agra, or Bijapore, or from villages on the banks of the Ganges. The place is too large, and the interior parts too difficult to come at, to be as yet entirely flooded with English or French manufactured goods, and cheap furniture from Bethnal-green. The objects produced must be, to a certain extent, real and genuine, and from the people themselves, without help from external source. Men work traditionally in Hindostan, and the same trade keeps in the same family from age to age in a way that is truly wonderful and beyond our powers of conception; so that whatever the disadvantages of such a system of doing things may be, there is, at least, one advantage,—the power of doing the work in a genuine and *bonâ fide* way. What the father does, and the grandfather has done before him, the son is now doing. The old idea which the family inherited so many ages ago has come down to the youngest child; so that time is almost annihilated, and the far distant part lives in the present. Of course, it need hardly be said that the few poor specimens of "Indian" work shown in a glass-case were from well-known localities,—Anglo-Indian productions, wherein there is always to be found an effort to copy some object or other of English manufacture taken over for English use, and made "Indian" by the simple process of carving Hindoo ornamental forms on it. It is a truly unfortunate and heartrending business; for it is neither one thing nor the other. An English scroll-ended-and-not-to-be-sat-down-on show sofa, covered all over with elaborate ornament from some Hindoo temple, dedicated to Siva, with all the emblematic figures left out, and nothing but little scrolls and unmeaning knobs of ornament sticking all over it, is not particularly interesting; and we can only in all charity sincerely hope that no "Indian" had anything to do with such an abortion and foolish waste of time, material, and money, beyond simply carving it as per order! What a pity it is that we cannot see some genuine work from the interior towns, uninfluenced by foreign work of any kind or from anywhere,—the unaided thoughts and design and work of the people themselves, made by themselves and for themselves, and for their own uses, and to supply their own wants. Let us hope that in the coming Exhibition we may see some few things from the India of the past and present; not from English Calcutta, but from some town or village of which no one here at present knows anything but the name. Working-men's exhibitions without *individuality* of both *men* and *country*, must be viewed as failures.

A NOTE IN GLOUCESTER.

ARCHITECTURAL interest in Gloucester centres almost entirely round the cathedral, the continued restoration of which appears to be the only work that can be called at all extensive, which has been carried on there for some time past. The nave and south porch, as our readers are aware, were restored some little time since under the hands of the great consulting physician in these cases, Mr. Scott: the restoration of the nave consisting chiefly in removing whitewash, and binding with circular iron ties some of the ponderous but probably not over well-founded columns; that of the south porch involving considerable reconstruction of tracery, &c. Operations have for some time past been vigorously progressing in the north transept, now all but completed; and a commencement has been made in the south transept by filling in with new stone a decayed portion of the north front. In this part of the work a good deal has been done in the way of trimming and reinstating decayed portions of the stonework, and the removal of the inevitable whitewash from the stone and the Purbeck shafts, which it had despoiled of their fair show; and the cutting and reinstating seem to have been as moderate in amount as were consistent with the endeavour to convey the appearance of newness and freshness which is expected of an architect who has a restoration put into his hands. The stone employed for the interior work is chiefly that from Painswick, a tolerably hard and very white stone. After the work in the transepts and choir is completed, it is understood that, if funds are forthcoming, the process of restoration will be extended to the presbytery and Lady Chapel. A great deal of whitewash there is here to be scraped off, certainly; and the mullions of some of the windows are much injured by time and weather, and require reinstating; but with regard to the interior, with its elaborate and multifarious tracery and fan-groining and screen-work, let us hope that this will be tenderly dealt with. There is no such dilapidation here as seems to call for the "sweet restorer," and a simple scarification to get rid of the offensive covering seems all that is necessary for some time to come, without any such further cutting and carving as would despoil the old masonry of the characteristic appearance and expression which no new work can absolutely imitate. The decoration of the choir roof, in colours in which blue and gilding predominate, though far less crude and strong than many examples of modern coloured decoration, yet is not otherwise than a confirmation of the opinions recently expressed by a well-known writer, through the medium of these columns, against the over-colouring of stone-work; and there was reason in the remark made by a local mason at work on the job, that "the roof looked a great deal higher, sir, before it was painted." There seems no reason either that we should see a mass of colour on the vault over white stone walls: on the contrary, such a treatment rather deprives the building of the monumental unity of expression given to it by a roof evidently and palpably of one material with the walling, and forming, in fact, an integral part of it. "Late" as the work is at this end of the building, one cannot but look with delight at this exuberance of delicate ornament in almost endless variety; nor are there many interior effects in English architecture more piquant and charming, in a way, than that produced here by the aspect, first, of the great screen of coloured glass forming the eastern termination to the choir, and appearing from some points inside as the final boundary of the composition, till a change of position reveals the further perspective of the Lady Chapel beyond, with its repetition of fret-work and coloured glass; and perhaps few things could bring more vividly home to us the singular rapidity of growth in the Gothic style than the contrast afforded between the severe and massive grandeur of the Norman work in the nave, and the display of lacework in stone in the Lady Chapel, and the extraordinary and unique *jeu d'esprit* of the flying rib meeting the vault pendant across the transept arches. Strike out the intermediate links of the chain, and who would suppose the two styles to be so closely connected, hereditarily and chronologically? Of the stained glass in the nave we do not speak with much admiration: the central west window is a very unfavourable specimen of the art (or manufacture); the best is that at the west end of the south aisle, by Messrs. Clayton & Bell. We regretted to learn that the organ at the cathedral is not only an inferior one in some ways, but very much out of order. Considering that the Gloucester folk have in Dr. Wesley the most distinguished living church musician as their organist, and that their cathedral is the scene of a triennial music festival, they ought certainly to carry out without delay the intention which we heard has been mooted, of providing an instrument more adequate to the situation.

As we have hinted, the architectural visitor in Gloucester will find little to interest him beyond the precincts of the cathedral: considering the long history the city has behind it, its four main streets, named (as in some other towns of Mediæval origin), Eastgate, Westgate, Northgate, and Southgate, are remarkably

devoid of any monuments of the earlier days of the place; nor do we know that a search into out-of-the-way nooks and alleys would afford anything to repay the trouble. St. Michael's, a very late Gothic Church at the central crossing of the main streets, is worth notice, as displaying a solidity of design unusual at the period, especially in the treatment of the buttresses at the angles of the tower, the lowest stage of the tower being brought out by a deep set-off to the face of the buttresses, and thus forming a massive base to the whole tower. In Westgate-street, St. Nicholas church shows what would have been a fair late tower and spire, but the latter is only half finished; one of the aisle windows, which are of a very late debased design, with round-arch heads, has recently been fitted in anew with a species of plate tracery, in a style we are unworthy to describe. The commerce of Gloucester being mainly in grain, has led to the formation of a commodious dock, surrounded by warehouses, for the lading and unlading of ships; the dock being approached by a canal cut from the Severn, at Sharpness Point, about 18 miles down the river, and which allows of a safe navigation for larger vessels than could well approach previously by the less safe route of the natural stream, with its various bends and shallows. Those who are interested in church decoration will find it worth while to take a walk or drive of two or three miles out to the pretty village of Highnam, and inspect the church there, which has been decorated with frescoes, as our readers know, by Mr. Gambier Parry, whose residence is not far from Highnam. So far as the decorations (which are still progressing) are completed, they consist, firstly, of a kind of diaper, of chocolate and green, in geometrical patterns, carried right round the nave as a dado; in the north aisle a conventional "drapery" design, in red and green, painted above this (the whole effect being here rather too dark); and on the south aisle wall a series of ornamental crosses, with texts, one between each window. The effect of this is brighter and pleasanter than on the north side. The chancel walls are painted in diaper of a similar style, but in brighter colours,—the dado in red and green, the upper part with crosses and fleurs-de-lis, in gilding, on a light ground. The more important items in the decoration consist of a large painting of Christ (enclosed by a vesica) and the Apostles, on the wall over the chancel arch, the spandrels being filled up by angels with trumpets, skilfully grouped, so as to fill in the space without any straining of the composition or attitudes. The upper portion of the painting is too much in an archaic and stiff style to interest us much as a specimen of figure-painting; but the eastern compartment of the nave, which has been more recently finished, is a great improvement in this way. On the south side we are shown the "Expulsion of Adam and Eve from Paradise" (we can scarcely congratulate Mr. Parry on his treatment of the female figure, as regards the refinements of drawing), and an angel flying over the group—a very elegant and happily-conceived figure—seems to direct their attention to the representation on the opposite side, where is painted the Annunciation. Under these two groups some heads of Scripture characters in medallions are painted, that of St. Peter showing considerable character and originality of expression. But by far the best bit of the work, regarded artistically, is the painting (on a smaller scale) occupying the position of a kind of "frieze" (if we may borrow a term from Classic architecture) over the windows of the north aisle. The portion finished, representing the entry into Jerusalem, comprises figures and faces of great beauty and refinement of expression; and we can only hope that the whole will be continued in the same simple and natural style, so far more pleasing to any unprejudiced eye than the more conventional figures, with gold nimbi, which are too often considered a *sine qnâ non* in church decoration. If the painting of the nave roof, however, is to be continued in the same strong and violently contrasted colours in which it has been commenced, it will soon kill the best of the frescoes below, by the help also of the heavily-toned stained glass which mostly fills the windows, and is of no very superior design. We very much question whether the union of stained glass with fresco-painting is possible with entirely good effect, the transmitted light being always so much warmer and more powerful than the reflected light. The chancel arch itself, we should observe, has been painted in such strong and variegated colours as completely to destroy the effect of the mouldings; the light tinting of the eastern arches of the nave is far better in appearance. In architecture we may seek powerful effect either from surface light and shadow or from colour, but not from both together; they are antagonistic, and the strong colour of the painter nullifies the effect of the rolls and hollows of the mason. Externally the church (by Mr. Woodyer, we believe) is a good specimen of modern Gothic work, the tower and spire especially being decidedly above mediocrity; and a very picturesque cottage for the sacristan, near the church, is a further specimen of the ability of the same architect. On the whole, we may return from Highnam with the feeling that there is architectural activity around Gloucester, although there is but little of it displayed within the boundary of the city.

TREATMENT ADAPTED TO MATERIAL.

AMONG the many varieties of skill which are necessary to the excellence of each work of art there is one which, as it seems to me, lies in danger of being overlooked, or, at least, of being treated with something like oversight,—I mean that particular skill that must emanate partly from the designer, but far more from the workman, by which the special qualities of the *material* to be dealt with are recognised, valued, and expressed.

At the first glance we should be apt to say that a beautiful form will be beautiful, whatever the material in which it is shaped; but this is now so generally admitted to be a false doctrine, that it is not necessary for me to pursue the arguments against it. My present object is to show that, given the *design suited* to stone, or wood, or metal, there yet remains to the workman an excellent field for the exercise of his perception and the display of that particular skill by which every excellence of his material is made the most of.

Without going the length of saying that *every* variety of *every* material calls for a special style of execution, I do say that the subject demands much closer attention than it receives, and that it is well to bring forward some of the more notable instances, and to point out how or where we may look for the peculiarities of texture or substance which should influence the use of our tools.

Let us, then, begin by considering the *solid* materials which may be moulded or carved. The first, and most important to architects, are those materials which may be classed generally as "stone." Under this head are included materials of very varied qualities and characteristics, so varied, indeed, that one almost may say that each variety requires its own treatment in sculpture.

We may, however, group them together broadly under a few heads; and then, looking back historically, we shall see that the whole style of art was, in early ages, affected by the peculiarity of treatment rendered necessary or possible by the characteristics of the materials used, bearing in mind that the most esteemed materials being used for the most noble monuments, and those monuments having the strongest hold upon the mind and the most powerful influence in art, so the working of those materials gave the key-note to the art-work of that age or country.

Granite.—Thus, as we find the earliest and grandest sculpture of Egypt worked in granite, the beautiful and durable stone of Assouan (Syene), so we find all Egyptian sculpture partaking, to some extent, of the characteristics of execution most suitable to that material. Broad, even surfaces, crudely-rounded contours, and obtuse or rectangular sections prevail. A thin "arris" or acute angle is almost unknown. The value of the material also is much enhanced by a high polish, which is only compatible with broad surfaces and bold roundings. Where greater detail is required, it is either cut deeply, at right angles to the surface, or slightly, through the polish, and left dull in contrast with the polish. And as the forms must be of the simplest and most conventional, so the detail must be *very* limited and very expressive.

Marble.—In the beautiful white marble of Greece we have a material the admirable qualities of which may almost be said to have had a large share in perfecting Greek art. The workman must have taken delight in its exquisitely even grain and pure colour, admitting, as they do, of the most delicate expression of form, and of the highest mechanical finish. Indeed, it is impossible to compare the progress of Greek sculpture, from the archaic to its more perfect development, without feeling conscious that the artists were gradually recognising the wonderful capabilities of their material, and were led on to fresh efforts and more careful study, in consequence.

In addition to its beauty, the ease with which it is worked, and its durability, encourage the use of fine sections in mouldings, sharp arrises, and delicate detail. The even, crystalline granulation of surface is admirably calculated to express the roundings and the most subtle gradations of shade. Consequently he who, overlooking these special qualities, executes his work as if in a coarser stone, throws away much of the excellence within his reach. The semi-transparency of marble gives a peculiar value to thin sections under some conditions; and occasional acute angles, in section, may almost be said to be necessary to the full exposition of the nature of the material.

It must not be supposed that, even among the ancients, an equal amount of intuitive skill was possessed by all the workmen employed on one building. Let any one who has the opportunity examine the several blocks which formed part of the frieze and cornice of the *Erectheum*, now lying in the British Museum. On looking closely he will find an immense difference in the method of finish in one block and another (compare those numbered 127-129). Even at this lapse of time one can almost say that the worker of one block was thinking of *his work*; the other of *his wages*.

The student of "material" will also do well to examine very carefully the sections of the draperies and other portions of the best Greek sculptures. He will find nothing overlooked there. Every surface, every edge or angle is so worked as to use to best purpose the light which falls on it. If, too, he observes in these works the treatment of the human face and figure, he will learn how the *breadth* of light must be preserved; and how, when emphasis is needed, the shadow must be cut so deeply as to overcome the luminous white of the marble.

Figured Marbles.—What I have been saying applies to white marble only. "Veined" or "figured" marbles admit only of the boldest moulded forms, and not at all of carved detail, which only quarrels with the "figure" which is the material's natural beauty.

Stone.—In the commoner varieties of building stone we have materials of a grit variously coarse, more friable, both in working and in wear.

These qualities necessitate coarser "arrises" and "fillets;" and, therefore, heavier contours in the mouldings. It is well to bear in mind that *the apparent finish or delicacy of mouldings is, to a great extent, determined by the delicacy or otherwise of the narrow fillets.*

The colour of the common stones is again less even than that of marble. The treatment of the detail has therefore to be vigorous enough to overcome its inequality. In comparing the buildings of Greece with those of Rome, we see that this difference of treatment is very observable.

The detail, in stone, requires stronger definition, which is obtained by greater relief and depth of cutting. So that often where low reliefs would suffice in marble, high relief and bolder forms are requisite in stone. I am, of course, supposing the conditions of light, or position, to be equal. Climate or other special circumstances may largely affect the treatment; nor am I now considering special *design* so much as special *workmanship*.

It will be readily understood that according to the coarseness, or fineness, or friability of the stone, the treatment may be modified upon the same general rules. It may, however, be as well to enumerate a few leading points.

In carved details, stone allows considerable freedom. Deep undercutting is admissible and useful when not carried to such excess as to expose the subject to risk. Projecting masses must always be corbelled, so to speak, in such a way as not to have a tendency to break themselves off. Thin edges are incompatible with so friable a material, but lightness may always be given by bevelling back to the ground.

Where strength is expected, a rectangular section is agreeable to stone: indeed, a square edge seems constantly demanded; and an edge presenting an angle of less than about 60° or 75° is too weak for the material. To sum up, the ordinary building stones require a firm, vigorous, substantial treatment, with sufficient breadth and depth of cutting to overcome the more or

less irregular colour, according to the distance at which the work is intended to be seen.

Of Stucco or Plaster—the treatment may be classed under two heads; that moulded by hand, and that cast in moulds. The two methods may also be blended.

In working plaster relief ornament by hand, a great freedom of touch and variety of form are attainable and desirable. At the same time, thin edges or deep undercutting are rendered undesirable by the friability of the material. The degree of finish must depend rather on the conditions of application, since its texture may be rendered as fine as that of ivory; and a pure and even tone of colour may be obtained, either in the material, or by subsequent tinting.

Almost any degree of vigour may be given by bold modelling, keeping the lights broad, and not too much softening away the tool marks. Excellent examples of plaster treatment may be seen in the ceilings of many old London houses of the period of the Georges, and the elegant and spirited stuccoes of both ancient and mediæval Italy afford valuable teaching. Where the ornament is intended to be painted or coloured, care should be taken to avoid narrow quirks, which may become stopped, or thin edges to be broken; and if the relief be very low an indented outline is useful.

For the treatment of plaster ornament cast from moulds, we cannot do better than observe Arabic or Moorish work. Except where a reproduction is attempted (with which we have nothing to do now), ornament produced in this way should be clear, well defined, not undercut, and arranged so as to draw readily from the mould, and require little subsequent finish. It is applicable, of course, chiefly for repeated or diaper ornament, &c. In Moorish work beautiful soft gradations of shade are obtained, *not* by rounding or moulding the face or edge of the ornament, but by introducing two or three distinct "*strata*" of ornament, interlacing with each other, each on its own level,—a plan in every way adapted for work cast in moulds. In combining the cast and hand-worked methods, the simpler and more rigid parts may be cast, leaving the lighter detail to show the workman's hand.

Many of the above remarks apply equally to *terra cotta*, in which, however, partly on account of the coarser material, and partly because its use is most often external, greater boldness of execution is demanded. A certain rough plastic touch, with rather hard edges and strong surface lines, tells best. (See the details of Certosa at Pavia; and for the higher forms of art, the Florentine portrait busts of the fifteenth century, such as Nos. 7,621, '61, and St. Jerome, 8,383, '63, in Kensington Museum.)

Undercutting, fine arrises, and fillets should be avoided.

From "terra cotta" we easily pass to the *glazed* material, as "della Robbia" ware, and to pottery. Here angular sections are to be avoided, the surfaces all rounded; and it must be borne in mind that, as a number of small high lights only perplex, it is desirable to maintain great simplicity and breadth in the moulded surfaces; and distinctness in the outline of the forms to be expressed.

Where the design is set off by a coloured or tinted ground, *without* glaze, a careful outline and sharply-executed detail are required; for examples we have but to look at the productions of Wedgwood, many of which are, in their way, perfect.

Under a *glaze*, however fine, low relief requires a more delicate and softened treatment, with an avoidance of hard outline or sudden protuberances. Of this class of work is the "Celadon" ware, of which a splendid sample is the Cobden vase, on view at Kensington. The conditions of this material are,—on an opaque tinted ground, a semi-transparent white relief, with a high glaze over the whole,—conditions favourable to extremely subdued relief and softened outline.

I allude to these finer descriptions of pottery, because, in the form of medallions, &c., they are occasionally used to decorate either the building or its accessories.

Wood Carving. — The grain and texture of *wood* vary so considerably, that comprehensive rules of general application cannot be laid down. It is not difficult, however, to show in what respects general rules may be observed, and at what points they must diverge according to the material to be dealt with.

Some woods are of so fine a grain, and so close a texture, that they are capable of almost unlimited delicacy of finish; and of these the harder sorts will take a soft hand polish, which places them almost on a par with ivory. I need only refer to that wonderful specimen of wood-carving—the cabinet, by Fourdinois, of Paris, from the Paris Exhibition of 1867, now at Kensington. Work of this description is, however, so exceptional as not to demand so much notice as the carving of the various woods in ordinary use.

In such woods as oak, walnut, or mahogany, we have materials with a more or less pronounced grain or texture, in colour not quite even, readily cut with a sharp edge, and of a tenacity altogether different from the brittle nature of stone, enabling it to bear considerable undercutting or perforation without risk. These are all qualities admitting of or requiring special treatment.

To commence with the first-named condition—the visible grain or texture. It is obvious that the workman will select for his carving that wood which is most *even* in texture, grain, and colour, since all strongly marked grain or figure tends to confuse and destroy the effect of his work. Still, even when he has done this, he has in *oak* a very apparent grain, and here or there some amount of "figure."

Oak.—The carver in oak, therefore, must seek carefully to execute his work in such a way as to overcome the opposition which these qualities present. His lights must be preserved broad and clear, and in high relief; the leading intention of all foliage distinctly marked, the finer lines or stems preserving a sharp outline. The shadows must be bold enough to explain the forms, intensity being given by bold undercutting. Much assistance to the expression may be given by the actual tool marks. Nothing is so fatal to the spirit of wood-carving as glass-paper. Yet, bold though the execution of the work be, it need not appear coarse; the strength and tenacity of the material allow of thin edges, and considerable freedom as to detached or perforated work. But above all things let the wood-carver avoid a thick, square edge; an edge at right angles with the face of the work. This at once gives his work a *stony* character, which no mere finish will obviate.

I know no examples better illustrating the exact capacities of oak than the exquisite stalls of Amiens (1528), and the beautiful panelled door enclosure, by Paul von Schelden, in the town-hall of Oudenarde. There is an excellent model of the latter in the Crystal Palace.

In *walnut-wood* we have a material extremely suitable for the carver's art. There are many varieties, differing greatly from each other; some abounding in strongly marked and often beautiful figure; others presenting a mellow, even grain (with but a slight "streakiness"), and an agreeable grey-brown tone of colour. When this latter class of wood is used (and its fine pores are, upon the completion of the work, filled up by a judicious wax rubbing), results may be obtained as satisfactory in the way of wood as those from bronze are in the way of metal.

To those who would learn the style of finish and execution adapted to walnut-wood, I would point out the numerous works of the Siennese carvers, the stalls of St. Pietro at Perugia, and of St. Maria Maggiore at Bergamo, both by Stefano da Bergamo. There are also some admirable benches and a desk in the little Sala di Cambio at Perugia; and the numerous grand doors in the Vatican, which likewise present excellent specimens.

In the Museum at Kensington there are a few good works of this class. Modern Siennese work they are, but the artist has well caught the style and method of the old carvers. I do not call to mind any prominent good example of *ancient* carving in walnut wood in that collection.

The numerous coffers in the Cartoon Gallery have no special merit of execution.

It will be observed in the examples I have quoted that a certain *precision* of touch is common to all of them. The lights are crisp and well preserved, always with a view to *carrying the eye along the motive of the ornament.* If it be a scroll with a fine stem connecting foliage or husks, observe that the eye is always made to travel *along the centre line of* the curve. The section of foliage or stem is such as to take the light in the proper direction; the fine stem is so sharply cut (though sometimes a mere thread) as never to fail of expression, either by means of its fine high light or sharp little shadow. In this way even the finest lines are not allowed to be lost in the dark colour of the wood. It will be found also that excellent use is made of the tool marks, which greatly assist the expression of the work.

I must not be understood to proscribe the use of the "*figured*" class of walnut-wood. On the contrary, this, beautiful in itself, should be used for such plain, flat surfaces as will exhibit and derive embellishment from its beauty.

Ivory.—Holding a place superior, but closely allied to the finer woods is ivory. This beautiful material has been very highly prized for the purposes of art from the earliest times. Its close, homogeneous texture peculiarly fits it for the finer kinds of carving; and the beautiful surface of which it is capable, together with its soft, even tone of colour, have frequently induced artists to adopt it for works of a size considerably beyond what we need consider now. The form and size of its natural growth may, in a general way, be taken to limit the size of its use, which is therefore ordinarily confined to a surface of a few inches. There is hardly any limit to the finish and elaboration of detail which may be given to a few inches of ivory. High relief or low relief appear to equal advantage, and the conditions attached to it appear most simple: the work must never be rough or coarse, and must always exhibit the exquisitely delicate texture of surface which is natural to it. Its strength admits of its being undercut to almost any extent, and of being worked to almost any degree of tenuity; whilst the remarkably soft gloss of its surface exhibits to advantage either the boldest or most delicate roundings.

The several *metals* in use for ornamental purposes present conditions different altogether from those distinguishing the materials which we have been considering. If we except *cast* iron, the condition of friability is wanting, and we are therefore at once admitted to the use of the thinnest sections and the most acute angles. Their different degrees of ductility also represent a special quality to be expressed. Their capability of being *bent* and *twisted* without losing their strength is a valuable quality to be recognised. In treating each separately we shall have to be guided partly by the different degrees in which they possess these qualities, partly by their colour, and partly by the greater or less extent to which they exhibit bright high lights, or are capable of receiving a burnished surface.*

THE CHURCHES OF LINDISFARNE.†

LEST our readers should be in doubt as to the exact geographical position of the Archdeaconry of Lindisfarne, we will premise a notice we are about to give of an architectural survey of it, by stating that it comprises the north-east coast line of Northumberland from Newbiggen to Berwick-upon-Tweed, and runs inland up to the base of the range of the Cheviot Hills. It also includes, as may be inferred, the seat of the Columbite Seminary, Lindisfarne, or Holy Island, the semi-island lying about two miles off the coast line, to the north of Bamborough, the old Saxon metropolis. Within its confines are seventy-six fabrics in which the service of the Church of England is performed, besides many ancient ecclesiastical buildings now in decay, and numerous modern edifices belonging to Nonconforming bodies. The district, until the year 1843, formed part of the archdeaconry of Northumberland,—one of the two archdeaconries into which the bishopric of Durham was divided; but at that date it was constituted a third division of the episcopal territory; and in remembrance of the early Celtic and Saxon see which preceded that of Durham, the title of Lindisfarne was conferred upon it.

We are not dependent, altogether, upon the architectural fortunes of the locality for the history of the churches, for there are various literary sources extant, belonging to successive centuries, from which conjectural outlines of some of them might be made out. The charges of the late and present archdeacons give many facts relating to recent alterations. Hodgson, in his voluminous "History of Northumberland," makes mention—too brief and unappreciating, sometimes—of the religious edifices of each parish. Raine, in his "History of North Durham," made scant, though not undiscerning, mention of those that are situated in that tract of country that until recently, politically, formed

* By Mr. J. D. Crace. Read at meeting of the Architectural Association. The remainder in our next.

† "An Architectural Survey of the Churches in the Archdeaconry of Lindisfarne, Northumberland: containing Plans and Views of seventy-nine Fabrics, and Sketches of the principal Antiquities in them." By Frederick Richard Wilson, architect. Photo-lithographed by M. & M. W. Lambert, Newcastle-upon-Tyne. 1870.

part of the county of Durham. Hutchinson, Mackenzie, and Wallis traversed part of the ground, and wrote of some of the fabrics according to their lights. In the seventeenth century we have Dr. Basire's account of the dilapidated state of most of the churches. Camden shows us the chief and choicest. Two years after the battle of Bannockburn, the "Taxatio Ecclesiastica" informs us, every church in Alnwick rural deanery was laid waste. This was in the fourteenth century. The thirteenth-century rolls of expenditure preserved by the Dean and Chapter of Durham incidentally hand down word of the building and repairs of some of the structures. And then we have the writings of Symeon and Reginald, the Durham monks.

Nevertheless, we turn with considerable expectations of advices, if we may say so, of interesting architectural and archæological features in a field so favoured, to a recent survey of the churches in this archdeaconry by Mr. F. R. Wilson. Among the seventy-nine fabrics he has measured and delineated there are twenty that mark the distinctive character of this border territory, in the possession of strong, sturdy, massy towers, capable of stanch defence. Edlingham Church, which stands, Mr. Wilson tells us, in the green lap of a valley between Alnwick and Rothbury Moors, is a case in point; and may be looked at as a fair representative of its comrades:—

"We may see that the Norman builders reared a nave and chancel here, and that the entrance into their church was on the south side, for sufficient of the Norman wall-stones still stand on the south side, at the east end, and at the point of junction of nave and chancel on the north side, to prove this; and the southern entrance is still intact, though it has been shrouded by a porch built in modern times. Before the bright, newly-quarried sandstone had time to tone down to the sad grey tint it now presents; before, too, the day of the Early English style had dawned, a north aisle was built, with an arcade of round-headed arches, such as were turned about the same time by the clever masons at Brenkburn priory. The caps of the columns of this arcade are scalloped, each indention being enriched with bead ornament; and a strong pele tower was built at this time, adjoining the west end, for the protection of the inhabitants of the district, and for their gallant defence when the Scots came swooping down from the hills and sweeping off all before them. This tower is still standing, unscathed and hale; built in regular courses of different heights, with very long quoins, to suit the moor stones; with no entrance save from the church, no window-openings less than man-height from the ground, and these of arrowy, precautionary dimensions. The north wall of the aisle of this period, with the exception of a pointed doorway, now blocked up, with which it was subsequently pierced, has, however, disappeared, and been replaced by modern walling, enclosing at its western extremity a vestry. The north wall of the chancel, some of the present window-openings of both chancel and nave, the flat ceiled roofs, the low-hipped slate roof to the tower, and the porch, appear to be portions of the same modern repairs. As at Shilbotell, the porch builders refrained from demolishing the Norman billet ornamented doorway, but contented themselves with enclosing it in their ample, sombre, and stone-seated porch.

My attention has been called to a curious fact about the stern old tower by the vicar, the Rev. M. H. G. Buckle. There is a receptacle for a bar to the door on the outside of the doorway, which circumstance shows, that when fastened, it was barred on the outside, from the church, and not from within. This indicates that it was probably used as a place of detention for prisoners of border warfare."

The incessant hostilities from the other side of the Tweed are also shown in the absence of ancient woodwork, all of which appears to have been destroyed; if, indeed, the acute Northumbrians were so incautious of their neighbours as to have furnished them with such a ready means of conflagration. With these exceptions, the churches in this district do not appear to be essentially different from others where good building stone is equally abundant. There are but seven spires in the archdeaconry, of which only two are ancient; there is but one crypt, which is at Bamborough; there are but few ancient bells; and ancient fonts are not numerous. But there are several fine Early English chancels; some curiosities, such as enigmatical openings of the nature, but not identity, of hagioscopes; nearly twenty recumbent effigies; and, rarer riches still, seven instances of Saxon remains incorporated in existing buildings, besides one instance of Saxon foundations uncovered within the boundaries of a Norman church, now extending over the same site. Another distinctive feature in some of these Northumbrian churches is the appropriation of an aisle, or a transept, as the burying-place of the lord of the manor. Since the rising in favour of the young Pretender, and we know not for how long before, the crypt of Bamborough Church has been only known as the Forster vault. As the pages and plans in Mr. Wilson's volume flutter over in our hand, we note that Sir Horace St. Paul thus owns considerable part of Doddington Church; that an aisle in Mitford Church belongs to the Mitford family; an aisle in Embleton Church to the Crasters; another in Holy Island Church to the Haggerstones; that great part of Alwinton Church is thus divided between the families of Selby and Clennell; that the Burrells occupy a transept, as a mortuary place, in Kirknewton Church; the Ogles, another in Eglingham Church. In these still, shadowy aisles lie the remains of the restless energetic beings who, in old times, organised the "Great Risings in the North," rumours of which ever filled the South with deep commotion. In the parish registers, too, is to be found word of some of these martial worthies; though the earlier generations, of course, belonged to the days when the only registration of their burial, beyond their heraldic devices upon their monuments, consisted of an entry of their mortuary gift in the account rolls of the neighbouring abbey or priory. One item in the survey, we must explain, consists of a copy of the first entries of baptisms, burials, and marriages in each church where the register is of sufficient antiquity to give them interest. The oldest register is that of the parish church on Holy Island, which dates from the reign of Queen Elizabeth.

Mr. Wilson's remarks upon the different modes of work practised by masons in the successive centuries, however, apply equally well, as we have indicated, to stonework in other localities. Of Saxon masonry, he takes the tower of Whittingham Church, with its "long and short" work at the angles, for an example.

For a specimen of Norman masonry, he takes Rock Church, in this archdeaconry. Here the stones are from 10 in. to 12 in. in height, even, not larger than a man could lift, and they are laid in regular courses. Eight centuries have rounded their edges at the interstices, and toned the amber sandstone down to a sad dove colour; but that is all, for the work of the Norman masons has stood well, and flinches not, albeit the walls are filled in with rubble only. The north wall of this church was removed under the author's own care, northwards, to admit of an aisle, when this rough filling-in was noticed. There is more Norman stonework to be seen at Bewick, Ancroft, Norham, Shilbotell, and it is always the same. The Transition-Norman masonry is better than this. A beautiful example of it exists in Brenckburn Priory Church. In this building, where round and pointed arches are interwoven in one fascinating design, the stonework is excellent, firm, and compact. Seven centuries of Northumbrian weather have failed to leave any mark upon it, save that of beauty of colour. The stones are rather larger than those of the Norman masons, but like them they are laid in even regular courses. Intelligence and devotion are to be read in every line of it. Whereas, we feel as we examine Norman masonry, that Saxon labourers carried the stones to and fro with protest and sighs, and perhaps with stripes from the Norman *ingénieur*, their taskmaster; this work impresses us with its silent appearance of ready compliance. There is an aspect of calmness and acquiescence in it, altogether captivating. We feel sure those who reared it believed they were doing so to the glory of the Most High. The Early English masonry is also excellent and regular, but on a vast scale, and massive. The narrow lancet lights left wide intervals of ashlar work, where all effect depended upon the finish of its execution. There is an air of austerity about it, but there is no short-coming; nothing less, in fine, than a rigorous stanch perfection. The chancels at Bamborough, Mitford, Holy Island, and Rothbury, the towers at Eglingham and Ingram, and the west end of Ford church, are examples of it.

Of the stonework of the succeeding centuries, he adds:—

"But in the Decorated period, when cultivated taste began to luxuriate in exquisite combinations of geometrical figures for ornamentation, the workmanship of the masonry was less considered. In the length of a course, here and there we find a stone too unwieldy, or too small. When it is too large it projects into the course above it, and the level of the next one is obtained by the expedient of placing a smaller stone than the average upon the top of it; and when it is too short, its full height is made up with another smaller one. By these patches a general appearance of regularity is maintained; and that appears to have been the extent of the aim. Where there was a surpassing window to come, full of gracious and deft lines of beauty,—a song of praise, indeed,—the Edwardian masons knew that the plain groundwork in which it was set would be but of little account.

And so with Perpendicular work. In proportion as ornamentation increased in esteem, the perfection of the ashlar work was disregarded. The stones of this time are about twice as long as they are wide: they filled the space that was to be filled quickly; and all taste and intensity of feeling were lavished upon the beautiful windows, the sumptuous doorways, the laughing, leering, grotesque gurgoyles; the dainty crocketings, the proud finials, the label terminations, the doughty corbels,—the coigns of vantage, in a word, of the carver's art. The tower and the south aisle of St. Michael's, Alnwick, and the south aisle and porch of St. Lawrence's, Warkworth, are examples of the period.

When we come to more modern work, we may see that the marble temples of Greece and Rome were in men's minds. Smoothness: wide surfaces of the smoothest finish were in vogue. This led to coating rough stonework over with plaster, cement, stucco: various inventions to obtain a resemblance of the effect of marble, at a small cost."

From these extracts it will be perceived that the author has not considered bare measurements, or even perspective views, to be sufficient to give a fair presentment of the architectural wealth of the district. Without going into minute details, he has strung together, in three chapters, particulars respecting the history of the see of Lindisfarne, of the priory established on the site of the Saxon cathedral in Norman times, and of the locality from the Reformation to the present day, with which it is necessary to be acquainted to properly appreciate much of the work in it handed down to the present age, before he commences his individual survey of each fabric. Perhaps his account of the building of the Priory Church, after the Saxon cathedral had been deserted by the Saxon monks, who fled before the Danes with St. Cuthbert's remains, is as good a specimen of his manner of treating his subject as the volume contains; but it is long; and curtailment would divest it of its speciality.

Remote as Northumberland may appear to counties lying south of the Humber, it is curiously associated with London merchants, and with London guilds and companies, as in the instance of Woodhorn Church. Furthermore, some of the longest, straightest, brown-brick London streets are the property of Northumbrian noblemen and gentlemen, whose forefathers have lived in Border castles and peles, and been buried in their own mortuary aisles, in the grey parish churches among the hills and heather, or on the bleak sea-coast, since the Conquest. Twelve hundred years ago the Northumbrian metropolis was in the vicinity of Lindisfarne. Mr. Wilson's notes and sketches help us to contrast the one with the other, as well as to see much of the intervening centuries, very agreeably.

ORNAMENTAL ART IN BRITAIN.

AT the annual meeting of the Halifax School of Art for the distribution of prizes, held last week, Mr. R. R. Holmes, librarian to her Majesty, Windsor Castle, delivered an interesting address on "The History of Ornamental Art in the British Isles." Mr. Holmes said that when a nation learnt art, its progress was very gradual, but when learnt by individuals, assisted by such excellent models and masters as those whom he addressed had, it was comparatively at a rapid rate; but the method of progress was essentially the same. Pure art had its natural home in Greece, and thence it was developed in the Roman Empire, until it became known as Byzantine art, with which we in this country generally commenced. In Ireland they had to invent a comparatively new art for themselves. That was in the sixth century, and in which Ireland had always been supreme. Art was the fellow-labourer of Christianity, and it was introduced into England by St. Columba, whence it was afterwards transplanted into other countries, particularly France and neighbouring nations. The speaker then gave a sketch of the progress of art throughout the centuries down to the present age, and gave specimens on a black-board of the various styles of ornamental art in the successive stages of its progress. It was remarkable that every change in art was coincident with the change in a century. In the thirteenth century in England ornamental art was in the bud, in the fourteenth the leaf, and in the fifteenth the flower. Up to the fourteenth century England led the van of art from the early ages. After the fourteenth century France added to power of expression by the English, that of colour. When art declined in the extreme East, the new art arose in the extreme West. Ireland began with the mastery of pencil, and England reproduced invention in form. To the power of drawing and beauty of imagination, France added the splendour of colour. The first thing that students should attend to was that of getting the mastery of their pencils, then to educate their thought, and reproduce the thought by the mastery of the pencil, after which came colour.

ZINC WHITE AND STIPPLING.

CONTINUING to speak on this subject,* Mr. Barff, in his Third Cantor Lecture at the Society of Arts, said,—In describing the manufacture of zinc-white on a large scale, such as is practised by Messrs. Winsor & Newton, I made one mistake. Mr. Newton, who was present, corrected me after the lecture, and I feel it my duty to mention this mistake, in order to correct it, as it is liable to lead some into error as to the process which is used by that firm; and from the way in which they make their zinc-white, you will see, I think, that it must have a greater body and a greater density than that which is made in the way I described. I told you that after the zinc had been burnt, not in a current of oxygen gas, but in a current of atmospheric air, the zinc-white, together with particles of metallic zinc which passed along with it, was treated with water and levigated, and that, by subsidence, it was separated from the small particles of metallic zinc. Now, that is a method which has been employed largely, but it is not the method which is employed by these gentlemen. They pass the oxide of zinc in such a manner, over a bridge from the place where the furnace is, that it is perfectly free from particles of metallic zinc; the oxide passes into a chamber beyond—a chamber of wood,—and, you will judge, therefore, that it has got pretty cool before it has arrived there. It is collected in this room, and when the room is about half-full, so full that when a man walks in the oxide of zinc is almost up to his waist, it is collected in pieces of sacking, and these pieces of sacking are drawn together and squeezed up tightly, so that the oxide of zinc, when newly prepared, is pressed into hard, dense masses. It is found that by this process the substance, as a pigment, has a greater body than when prepared in the other way; and inasmuch as the want of body in zinc-white is one of the objections to its employment by artists and by decorative painters, this remedy does, to some extent, rectify that defect. But I cannot say that, by any process whatsoever, zinc-white can be made to have the body of white-lead. I think it cannot; but still I think it is the duty of those who are engaged in art to weigh in the balance the disadvantages of both substances. I think I showed you that white-lead is a substance which loses its colour, and, in time, loses that for which we most prize it, viz., its body. Now, zinc-white does not do that; and if there is a difficulty in employing it in the first instance, still it is better to employ it than to use a substance which is liable to such destructive influences as white-lead. Do not let it be understood for one moment that I am attempting to make a crusade against white-lead. I have no object in speaking against it, but my desire is that the works of artists, whether those engaged in high art or decorative art, or whether they be simply house-painters, should be performed with materials which will effect as perfectly as possible the object which they wish to attain. If a wall is painted with white-lead, it can be finished with zinc-white. I shall be met with this objection, perhaps, by practical painters, that the zinc-white will not cover well upon the lead. That is true, if the flatting is done in the ordinary way, but if you will simply allow a man to follow the person flatting with a large stippling-brush and stipple, then you will get your covering sufficiently solid for all purposes, and it will have a better effect upon the eye than if it were absolutely solid, for the small interstices that are left between its particles show the ground well, and give transparency to the effect of the mass upon the eye. We know well how beautifully stippled work looks. We know also that when we paint with a mixture of colours, intending to produce a certain tint, the tint produced is not as satisfactory as if we paint with these colours separately, one upon another. Why is it that artists glaze? It is simply that the ground colour underneath may have its value through the superimposed tint. From what I said about the effect of colour upon our visual organs the other night, viz., that waves of light are passing to a certain substance that absorbs all but one, or nearly all but one, and sends back that to our eyes, it follows that if we get wave motions of two distinct colours acting upon the retina, the sensation is much more satisfactory to us than if we got them so mixed that the wave motions act upon one another, and neutralise one another to produce that effect. If we desire to paint a wall with a sort of sage green, or Quaker green, as it is sometimes called, we know that by mixing a certain green pigment with a certain amount of red colour and yellow, we shall produce such an effect; but if we paint the wall first with red, and then stipple the green pigment over it, we shall have small spots of red sending back their reflected rays to our eyes, and the effect of such a treatment is far more agreeable, and the colour far more beautiful, and the tint far more pure, than if we were to mix all the pigments together which produce that colour, and lay them on all at once.

The subjects in nature which we paint are none of them flat-coloured. The green leaves we see, and depict in our pictures, are not really all green; for if you examine them under the microscope, you will find that they derive their colour from a number of small particles of green floating in an almost colourless menstruum, so to speak. Again, the human face represents to us a certain colour, but there is no large surface of that face which is of the colour which we see. There is a colourless skin over a skin which gives colour to the human physiognomy; and therefore the light, before it is reflected back to our eyes, has to undergo refraction. Then, again, when we look at the skin beneath, and examine it, we find that the colour is not evenly distributed over its surface; that here and there are spots, more or less near one another, of red, and others yellow, the red derived from the blood-vessels, and the yellow derived from fatty matters, and so forth; so that what we see is not a flat colour; and the way in which we represent that, I humbly suggest, should not be according to a simple flat treatment of combined colours, but the effect should be obtained from a judicious admixture of those colours by a process somewhat akin to stippling.

* See p. 26, *ante*.

ODD DOINGS IN ACTON, MIDDLESEX.

SOME serious charges have been made against the Acton Local Board, at first anonymously, through the local *Press*, and more recently by the writer in his own name, Ewen Robertson. Although described as a "common carpenter, out of employ," he is evidently a man of some education, with a clear head; and, when before the Board, prepared to justify what he had said, showed that he was not to be easily put down. He may or may not be right,—some of his assertions are obviously overstrained; still, the Board, if wise, will reply to his charges. We will not now go through them, although it may become necessary to do so; but will mention two or three of them. If correct, they certainly serve to show that change is necessary in Acton. Bye-law 99, as quoted by the writer, says:—

"'The walls of every new building shall be constructed of such thickness as shall be approved by the Local Board, and the foundations shall rest on solid ground, or upon concrete, or upon other solid substance.'

Now when gentlemen make ridiculous laws to rule a large community, they must forgive the said community if they form some very ridiculous ideas. Should they say that the said law was the invention of a partially-diseased brain, every sensible man in England would believe them. This law belongs to the feudal ages, and not to the nineteenth century. By this law you rule supreme above Acts of Parliament. You can allow one builder to build a wall 4½ in. in thickness to whatever height and purpose he may think proper, if he does not intrude upon Bye-law 96; while another builder you can compel to build his garden-walls 18 in. thick. You, gentlemen, but you only, can drive through this bye-law with five elephants abreast. In my letter of the third December, I stated that you gentlemen were a mystery. Now, I maintain that you are a mischievous mystery; which the following facts will substantiate:—How is it that you have compelled Mr. ——, builder, in accordance with Bye-law 101, to carry his party-wall through his roof; whilst at the same time you allowed Mr. ——, builder, to build three houses in Grove-place without the said walls?"

Again, he says:—

"In your Bye-law 99, the following words are used:—

'And the foundations shall rest on solid ground, or upon concrete, or upon other solid substance.'

Now, if you have compelled other builders throughout Acton to build according to this bye-law, I find you have not compelled Mr. ——, builder, to fulfil his share of local stability. I find that he has built his houses there upon the top of the ground that was turned over (four months before he commenced to build) 10 in. deep, and sowed and planted with peas and cabbage; the builder did not even take one inch of footings out, or use one ounce of concrete in some of his houses. The gentleman who used the ground was Mr. Jefferies, of Gunnersbury-place, who will give you further information, if required. To build houses upon the top of such loose soil is inferior to Highland cots or Irish cabins. Yet if it is to be a rule, let all builders do the same."

Whether Mr. Robertson has exaggerated or not, one thing is quite certain, that the general Building Act which applies to the metropolis should be made to apply also to Acton and other suburbs, so that it may no longer rest with the local Board or its officers to settle whether a wall shall be 4 in. or 14 in. thick. With such uncertainty prevailing, we are not surprised to hear that land in Acton is less rapidly covered than is desired.

METROPOLITAN BOARD OF WORKS.

AT the usual weekly meeting of this Board, the chairman opened fifteen

Tenders,

for the works of deepening and reconstructing the sewer in Queen-street, Hammersmith. The highest tender, that of Mr. William Crockett, was for the sum of 4,737*l.*, and the lowest, Mr. George Young, for 2,837*l.* The last tender was accepted.

Damaging St. Stephen's.

The Works and General Purposes Committee brought up a report, recommending—

"That the Commissioners of Her Majesty's Works, &c., be informed, in reply to their letter relative to settlements in the buildings of the Speaker's stables in Millbank, and also in the pavement, gates, and railings of New Palace-yard, to the effect that the Board will, at the proper time, cause the injury done at New Palace-yard by their works to be made good; but that, with regard to the settlement in the Speaker's stables, the contractors assert that it was in existence before the commencement of those works."

The report was unanimously agreed to.

The Auction Business of the Board.

Mr. E. Dresser Rogers moved the following proposition:—

"That it be an instruction to the Works and General Purposes Committee not to carry out the resolution come to by them at their last meeting, viz., to allow Mr. Goddard, assistant valuer in the architect's department, to take out a license as an auctioneer, to sell the old materials of property purchased by the Board for public improvements."

The motion was carried by a majority of 24 to 6.

Tramway Schemes for the Metropolis.

The Parliamentary Committee presented a printed report with regard to the numerous tramway schemes it is proposed to carry into effect in the metropolis. The committee considered, that in the last two sessions Parliament had affirmed the principle that tramways were suited to large towns, and a benefit to the population; therefore they had confined themselves to a consideration as to the best modes of carrying out, and they made various recommendations as to lines to be laid down. These recommendations included lines in many of the chief metropolitan thoroughfares, such as Oxford-street and Holborn, Piccadilly, Tottenham-court-road, New-road and City-road, Caledonian-road, &c., and all the recommendations were adopted,—with one exception, as to Uxbridge-road.

THE SANITARY CONDITION OF NEWLYN.

SINCE the date of our article, much has been done in the way of complication, by the three, or rather four authorities, which govern this place. We left Newlyn sick and dirty; it is so still, yet the Madron Highway Board has done something, the Paul Local Board has done something, the Penzance Board of Guardians has done something, and the Penzance bench of county magistrates has done something: the grand result is—nothing.

It would be tiresome, to the point of pain, to say what they have done, but they are now trying all they know to make a scapegoat of the county surveyor (much to the discredit of those concerned).

Dr. Buchanan, from the Privy Council Office, has been down, and therefore we hope something will result for the benefit of the place; if not, the sooner England's sanitary laws are altered the better. We do not accuse the local authorities of want of earnestness; they are earnest enough, but we think there is sore need of a directing power. We would ask, supposing this county drain were clean enough to satisfy the most fastidious, would that put *garderobes* sufficient for 1,500 people in the place? Does the fact of the existence of one unclean (!) drain explain the fact of there being houses, containing twelve inhabitants, with no "convenience;" and yet we understand the county surveyor declared at the quarter sessions next subsequent to our paper, that such was the case. If a person owning houses and land in the place happens to be a county magistrate, is *that* a reason for fear of action?

If the district magistrates are positive of the

justice of their justice, why do they hesitate to levy the fine that they have imposed on the county surveyor of one pound a day until the alleged nuisance is abated? We recommend the formation of a committee (a small one), and, with an engineer to advise, at once beginning the work. Proper conveniences should be at once erected; and, for our own part, we believe that a practicable scheme for the utilisation of the sewage, and so turning it into money, would soon suggest itself.

One way would be by collecting the sewage at two or three points (not one point), according to levels, and so distributing it: the stream would afford lifting power if required. We cannot resist pointing to Newlyn and the authorities which govern it, as examples of the urgent need there is for a Central Controlling Board, both for highway districts and sanitary arrangements. PRO.

KEIGHLEY TRADE SCHOOL.

THIS school was to commence its operations on the 18th inst. It inaugurates a new era in the educational history of the neighbourhood. We gave a view of the building for the Keighley Mechanics' Institution and School of Science and Art when its erection was commenced, and at the opening of it we noticed it favourably. The several departments have got fairly to work, the opening of the Trade School being the last step taken. The club portion possesses a good supply of papers, periodicals, &c., and draughts and chessmen; whilst among other attractions, we are told, for the small charge of 2d. "hot tea and coffee may be had at any hour."

The evening elementary classes have been well developed since the building has been opened, and now there are voluntary teachers to over 300 boys and young men. A girls' class has also been formed. The superior accommodation for art purposes, at the disposal of Mr. Stevenson, is taken advantage of by a class of young ladies during three mornings a week, and at night by over 100 male students. Lectures on scientific subjects are being given in the Lecture Theatre during two or three evenings a week, and now the Trade School is to be added to the features of this important establishment. From an interesting paper on the subject of the Trade School, by Mr. Swire Smith, the Honorary Secretary, we learn that the rule and experience of the Bristol Trade School have been taken advantage of in the establishment of the Keighley School. Mr. Spencer is the English and science master.

THE LONDON BUILDERS AND THE LAW COURTS.

THE following, we have reason to believe, are the chief alterations that have been made in the form of contract:—

The time for completion of the first contract is extended from seven months to twelve months. The penalty for delay is *not* to be enforced should unforeseen circumstances arise beyond the contractor's control. The contractor is *not* to be bound to execute anything unless it is obviously shown on the drawings or described in the specification, or unless he be paid for it as an extra. The contractor is *not* to be bound by the certificate of the architect if he shall consider himself unjustly dealt with. The certificate of the architect is *not* to be under all circumstances a condition precedent to the contractor having the power to obtain payment.

In the original form of contract the word *not* was omitted from the above-mentioned conditions.

CONCRETE AND DAMP FOUNDATIONS.

SIR,—Seeing in the *Builder* of the 24th of December, 1870, "Heat and Damp," with a question on each, and answers to them, I beg to take exception to the latter answer, "A bed of good concrete under floor will keep damp down." Now this I do not think correct, because when lime and sand are mixed with shingle (or beach, as we call it in Sussex), a porous substance is introduced, which substance, when in contact with a clay soil, will absorb the moisture, and bring it to the surface of the bed of concrete. Any of your readers may try an experiment for their own satisfaction in the following manner. Let them make a lump of concrete in the shape of a common brick; let it remain to dry; when quite dry, put it into a vessel with an inch or two of water in the bottom. In a very short time it will be found that the water has impregnated the whole of the lump. At the same time let them put into a vessel some shingle quite clean, then let them fill the vessel up to within 2 in. of the surface of the shingle, and they will find the water will not reach the top of the shingle; that is, the shingle being non-absorbent, the top stones remain dry. In this part of the country (Hailsham) we use shingle to pave on. We usually put on the clay about 4 in. of shingle, and thus pave on that, laying the brick in mortar. We then get a dry floor.

JASON THOMPSON, Bricklayer.

*** A bed of good concrete (over the whole site), that is, properly compounded of shingle, sand, and Portland cement, will be found, as we stated, to keep down damp likely to rise from clay soil.

RAILWAY EXTENSIONS IN 1870.

ABOUT forty years since an event occurred in Lancashire that was considered of national, almost of world-wide importance, and it has proved to have been so, from the wonderful results to which it has led. It was the opening of about 30 miles of railroad. Many much more extended lines have been opened since that time, that have excited little more than a passing local interest, and in some instances scarcely even that. The ramifications of the railway system of the United Kingdom are now so extensive, that the additions from time to time of loops, junctions, extensions, even of new lines of considerable mileage, almost escape notice, and their magnitude, as an aggregate, can only be appreciated by bringing the additions together at certain seasons.

The last four or five years have been less than usually productive of either railway bills for new works, or of completed lines; and it is almost startling to find that in Great Britain, in the course of 1870, nearly forty extensions, junctions, and new lines were added to our railway system. These were various in extent, from the Dingwall and Skye, of 53½ miles, to numerous short junctions, of from a quarter of a mile to a mile in length. The most important additions to the railway system of the metropolis, referred to in a review of the year, in the *Builder*, was the opening of the Metropolitan District Railway from Westminster to Blackfriars Bridge. The remainder of the Metropolitan District line may be expected to be completed in autumn of the current year. Its terminus will be in Cannon-street, opposite the end of Queen Victoria-street; and there is now, after the legislation of last session, little probability that the "inner circuit," so much spoken of and looked forward to, in past years, will ever be completed. The Metropolitan line, which will furnish the other end of the horse-shoe, will probably terminate at Broad-street, in a working physical junction with the Great Eastern and East London lines, on a low level.

The remaining extensions of the metropolitan system opened during 1870 have been,—The Walthamstow Branch of the Great Eastern, of 2¾ miles in length; about a mile of the East London, extending it to a junction with the South London line; a branch of the London and South-Western of 7¼ miles, the Aldershott and Farnham; and a ¾-mile junction at Hammersmith; a London and Blackwall extension in the Isle of Dogs; and lastly, a junction of about a mile in length between the Midland and the Tottenham and Hampstead Junction lines at Kentish-town. All of these are more or less important; the last referred to will utilise the Tottenham and Hampstead, which has done very little service hitherto, and enable the Midland Company to carry their goods and mineral trains to the Victoria Docks.

Among the new lines opened in England have been several important extensions in connexion with the Midland system, including a line from Chesterfield to Sheffield of 13 miles; the Cudworth and Barnsley line of four miles, with several junctions; the North-Eastern, which has added to its system the York and Askern line of 26 miles; and a very important junction at Newcastle—the Quayside line of 2½ miles, bringing its system into connexion with the quays on the Tyne. This line has been long in hands, the delay in its completion and opening having been mainly caused by the corporation. It is expected to prove of great value to the commercial community. The Darlington, Merrybent, and Barton line is also of great importance, from the mineral traffic expected to be created by its connexion with limestone, ironstone, coal, and copper mining districts; it brings a supply of limestone, for fluxing the iron ore, above twenty miles nearer Cleveland. The line has a fine bridge over the Tees. It has still to be completed beyond Barton. The Silverdale and Market Drayton line, of 12½ miles, has five stations. It brings the agricultural districts of South Shropshire into connexion with the Potteries, and North Staffordshire into connexion with the Great Western at Market Drayton. The London and North-Western has added to its system a line from Saddleworth to Marsden, Yorkshire, and important connexions with the North Docks, Edge Hill, and Bootle, at Liverpool. The Northumberland Central Line has been opened to Rothbury, — about 13 miles; and the line of the Manchester, Sheffield, and Lincolnshire Company has also been opened between Rotherham and Mexborough, a length of 6 miles. The Lancashire and Yorkshire system has received additions of about 6½ miles at Rochdale and Horwich; the Cheddar and Wells line, of 8 miles, has been added to the Bristol and Exeter system; the Winsford branch of the Cheshire lines, of 6 miles; and the Garstang and Kust-end, in North Lancashire, have also been opened. Numerous other small junctions and extensions have been opened in England during the year, but the most interesting, and, as regards mileage, the most extensive additions, made to the railway system of Great Britain during the year, have been in Scotland. These include the complete opening throughout of the Solway Junction line, which crosses the tidal waters of the Solway Firth. The line has been opened for goods and mineral traffic for nearly twelve months, but Colonel Yolland, the Board of Trade inspector, has not been able, until quite recently, to certify the section from Bowness to Kirtlebridge for passenger traffic. This length, of about 8¼ miles, includes a portion over elastic and rather treacherous moss, that has caused a good deal of trouble; the difficulties presented have been at length completely overcome. The Caledonian Company has opened the Dundee and Forfar line of 17¼ miles, and the Carmyllie Branch of 5½ miles. The new line of the Glasgow and South-Western, between Ayr and Mauchline, reduces the railway distance between the two localities from 30 to 11 miles. The opening of the North British, Glasgow, and Coatbridge line, of 8½ miles, is hailed with great satisfaction in the localities affected, and is expected to prove of great advantage to the North British Company. The works of the Glasgow City Union line, now opened for 3 miles, are so substantial and elegant in character as to have been a source of pardonable pride to engineers, contractors, proprietors, and the inhabitants at large. Captain Tyler, R.E., the Government inspector, reported in the most favourable terms as to the excellence of the works throughout in design, materials, and execution. The line is one of the most substantially and tastefully constructed in the kingdom, and only less costly than "the Underground," the Charing-cross, and some other metropolitan extensions. The Glasgow and South-Western, it is stated, subscribed 440,000*l.*, and the North British Company 300,000*l.* towards the capital of the City Union. The union line has stations at Shields, Dunlop-street, Gallowgate, and Belgrove, all of which, notably that at Dunlop-street, are handsome and commodious, fitted throughout with the best modern appliances for the comfort of the passengers, and the proper conduct of the traffic.

It is almost "as smoke to the eyes and vinegar to the teeth," with the thermometer below freezing point, even to think of railway travelling amid the ice-bound locks and snow-covered mountains of the Highlands of Scotland; but even now the scenery opened up by the new railways has its grand, albeit wild, beauties, and in the vernal seasons the charming districts made accessible will doubtless be the resorts of multitudes of tourists. Among these Highland lines are the Dingwall and Skye, of 53½ miles, through some of the most wildly grand scenery in the north of Scotland, the train passing, in many places, with perpendicular beetling craigs on one hand, and a yawning abyss on the other. The cause of the delay in the opening of this line was one not often heard of,—that the fences were not sufficient to keep off the wild deer. The Dingwall and Skye line open up the western Highlands by the best route from Edinburgh, Glasgow, London, and all parts of the south. Dingwall is reached by a run of 162 miles from Perth upon the Highland Railway. The "ballast" on

this line attracts the attention of southern visitors interested in such matters, being of granite, in rather large lumps; clay for burning, or gravel, being unknown in the district. The Duke of Sutherland's railway, now open, 16¼ miles, is another interesting addition to the railways of the far north. His Grace, who is not unaccustomed to the foot-plate of the locomotive, drove his own new engine, the "Dunrobin," in the first experimental trip over the line. The train consisted of an engine, a carriage, and a brake-van, and conveyed their Royal Highnesses Prince and Princess Christian, the Duchess of Sutherland, and a number of the aristocracy and gentry of *ultima thule*. The noble driver shut off steam, and applied his brakes, at Helmshore, "exactly to time," and was received with tremendous cheers by the assembled Highlanders, many of whom probably had never before seen a locomotive or a railway carriage. Yet another new railway in the north well merits notice,—the section of the Callander and Oban line, from Callander to Killin, 17¼ miles in length. The line starts from the Dunblane, Doune, and Callander branch of the Caledonian, and, proceeding in a north-westerly direction, skirts the base of Ben Ledi, and is carried through the picturesque pass of Leny. For nearly five miles the line is along the banks of Loch Lubnaig, or the winding lake, its title to the name indicated by the fact that the line is carried in its course over six arms of the loch. The scenery is of the most beautifully picturesque character. At nine miles from Callander, Strathyre, the first station, is reached. The next station serves "Balquhidder," and the "braes" of that ilk. In the graveyard surrounding the auld kirk o' Balquhidder, the remains of the famous cateran, Rob Roy, were interred; and were sometime since the object of a pilgrimage, or rather a visit, by Queen Victoria. Fine views of Loch Earn are obtained in this locality. Farther on, Glen Ogle, or the terrific glen, is entered, and the line passes in some places at a height of 400 ft. above the bottom of the ravine. There are numerous bridges in the glen, one of them of twelve arches, of 30 ft. span, and 35 ft. high. The line terminates at present at Killin, at the upper end of Glen Ogle. The works of the next section, from Killin to Tyndrum, are in progress.

NEW LODGING-HOUSES AND HOSPITAL ACCOMMODATION FOR GLASGOW.

EARLY last year we gave a brief yet somewhat comprehensive sketch of the social and sanitary condition of Glasgow. We also took occasion to point out where and how, and in what particular direction, these improvements were needed.

It is satisfactory to hear that our labours in many quarters have been productive of some good, and promise to be still more so. Our friends across the Borders seldom appear satisfied or in humour when one of their southern contemporaries happens to draw attention to their sanitary or social shortcomings, and his crime is none the less even though his facts are supported by stiff and undeniable figures. The Scot is not given to "befoul his own nest," although he may desert it for warmer latitudes. He loves his country, though, unlike Cousin Pat, he seldom cares to go back to it. The municipal authorities of Glasgow are seldom at fault, except now and then. The *North British Mail* recently did good service by its dark pictures of social life and living in Glasgow; and now the *Glasgow Herald* is furnishing some interesting particulars of the past and present of the city on both sides of the Clyde. Some of the ground we went over is now being trodden again with advantage. We spoke strongly of the want of proper dwelling-houses for the working classes and the very poor of Glasgow; and we also instanced the wretched places in existence and the localities in which they were situated. We are glad to see that in one of the quarters we mentioned as amongst the worst, a large building is being converted into lodging-tenements for the poor. This building is situated in Drygate: there are a number of mean, tumble-down looking structures at the head of this locality, and several wretched "registered" lodging-houses for many years have been allowed to exist here. The City Improvement Trustees began several months ago their operations in Drygate, and the city architect and his assistants have finished a building which, according to the description of the Glasgow press, "is four stories in height, and presents a frontage architecturally plain but neat." On the basement story is a pay-office and a provision-shop; and at the side of the entrance passage is a dining-hall extending the whole length of the building or 50 ft. by 20 ft., by 13 ft. in height. The kitchen is in the rear. The superintendent is furnished with house space on the ground-floor; and all the sleeping accommodation for the lodgers, as may be supposed, is in the upper and inextinguishable flats. Every flat has four wards, and every ward is constructed to contain twelve sleepers, and twelve times twelve being one hundred and forty-four, there is consequently that number of beds. There are lavatories on each landing, and the proper ventilation of the building, we hear, has been attended to.

Let us say plainly at this point that this new lodging-house for the poor is not exactly a model one, but simply a sort of new and improved "casual ward." No matter how low the charge may be, we are doubtful of the success of the experiment in such a city as Glasgow. The working classes will not patronise such a structure, no matter how poor any of them may be; and the homeless and houseless poor of Glasgow who avail themselves of this lodging will have to submit, as far as we can see, to similar conditions as the pauper casual of the workhouse, who has to "clear out" at a stated hour in the morning, with the difference that when he pays for his bed and has to buy his supper or his breakfast, he will not, of course, be compelled to break stones or pick oakum in return.

Scotch habits of life and location differ in some particulars, and what might be found to answer tolerably well in London might be altogether unsuited to Glasgow or Edinburgh. As far as we can view the matter, we believe that all isolated attempts at meeting the requirements of the homeless or semi-houseless poor on such a plan as that now in course of adoption in Glasgow, will be unsatisfactory. The poor and indigent, to be properly helped, must be classified, for there are grades of poverty as well as wealth. Are we to admit in one indiscriminate batch the pick-pocket, the vagrant, the shoe-black, the match-seller, the blind, the lame, the deaf, the deserving mechanic on tramp, and that other large army of Arabs, Ishmaels, and Wandering Jews who periodically patronise all our poor-houses from Cornwall to Caithness. If the temporary homeless or houseless have to pay for their bed and board, be the price ever so small, they will not care to avail themselves of one liable to such queer neighbours. We would like to know if the outside poor can avail themselves of the same advantages as the lodgers in the purchase of eatables. A little benefit might accrue thereby.

There is also in course of construction a female lodging-house, on a precisely similar plan as the male. This is situated in East Russell-street. The accommodation for sleepers here will be for under 100. We cannot think that, with all their good intentions, the Glasgow City Improvement Trustees have yet hit upon the right plan. Still they are to be encouraged and commended for their exertions in so laudable a direction.

In the matter of hospital accommodation for the poor of Glasgow, there has been some activity to meet the supposed urgency of the case. About ten years ago the Royal Infirmary was the only hospital in Glasgow for the decent and respectable indigent or working classes, unless those who were within the poor-houses. Subsequently in Parliamentary-road an auxiliary temporary fever hospital was erected; and during the last two years this has been extended. The spread of relapsing fever renders it necessary now for the welfare of the Glasgow community to have increased accommodation for fever patients. In the eastern districts lands known as Belvidere, on the south side of London-road, have been purchased. The property consists of about 35 acres, and there is an old mansion in connexion. Here at present eight temporary sheds are being constructed, intended to accommodate 400 patients. It is to be hoped that out of this present hurried and temporary arrangements the nucleus of a permanent foundation will soon arise. The present mansion-house could shortly be converted into a standard fever hospital, and wings could be soon attached. With or without the present mansion, the lands are large enough, and favourably situated, for any treatment that might be determined upon. In the meantime, of course, the epidemic must be met, leaving in abeyance the question of future architectural design. The purchase-money for the lands of Belvidere is said to be 17,000*l*. This would be a rather heavy sum, if the consideration did not exist that a portion of this property is well situated for building purposes, and that, after some time, the public outlay will return to the city. When the permanent hospital becomes a reality, we trust there will be sufficient open space left around it. The fever-stricken are always athirst, and pure air is as necessary for their recovery as kind treatment.

THE STATE OF WAPPING.

THE editor of an East-end newspaper attempts to throw discredit on the statements made in our recent notice of Wapping. He does not disprove any of the particulars, but falls back upon the very safe and handy plea of charging us with exaggeration. He would point out that not very distant from our own office, viz., Drury-lane, we could find as vile and foul spots for description as in Wapping. Our contemporary is young in London journalism, and unread, or he would know that the districts he alludes to have long since been exposed in these pages; and that long before the daily papers gave attention to such subjects, the *Builder* was labouring earnestly to make known the condition of London. He would better show his fitness for the position he holds by furthering our endeavours than by the time-serving and injurious course he takes.

We print part of a letter from an independent witness, addressed to the editor of the *Standard*, who had reprinted some passages from our article, and sensibly commented on them:—

"Your article in yesterday's paper, on the state of disease and destitution amongst the poor in Wapping is attracting a great deal of notice; but in the case of every comment I have heard made, the good-natured, easy-going people say, as no doubt they wish—'It can't be quite true; it must be an exaggerated account!'

I beg to state, as an independent witness, that it is within the truth. I could lead your reviewer to scenes exceeding any he has described.

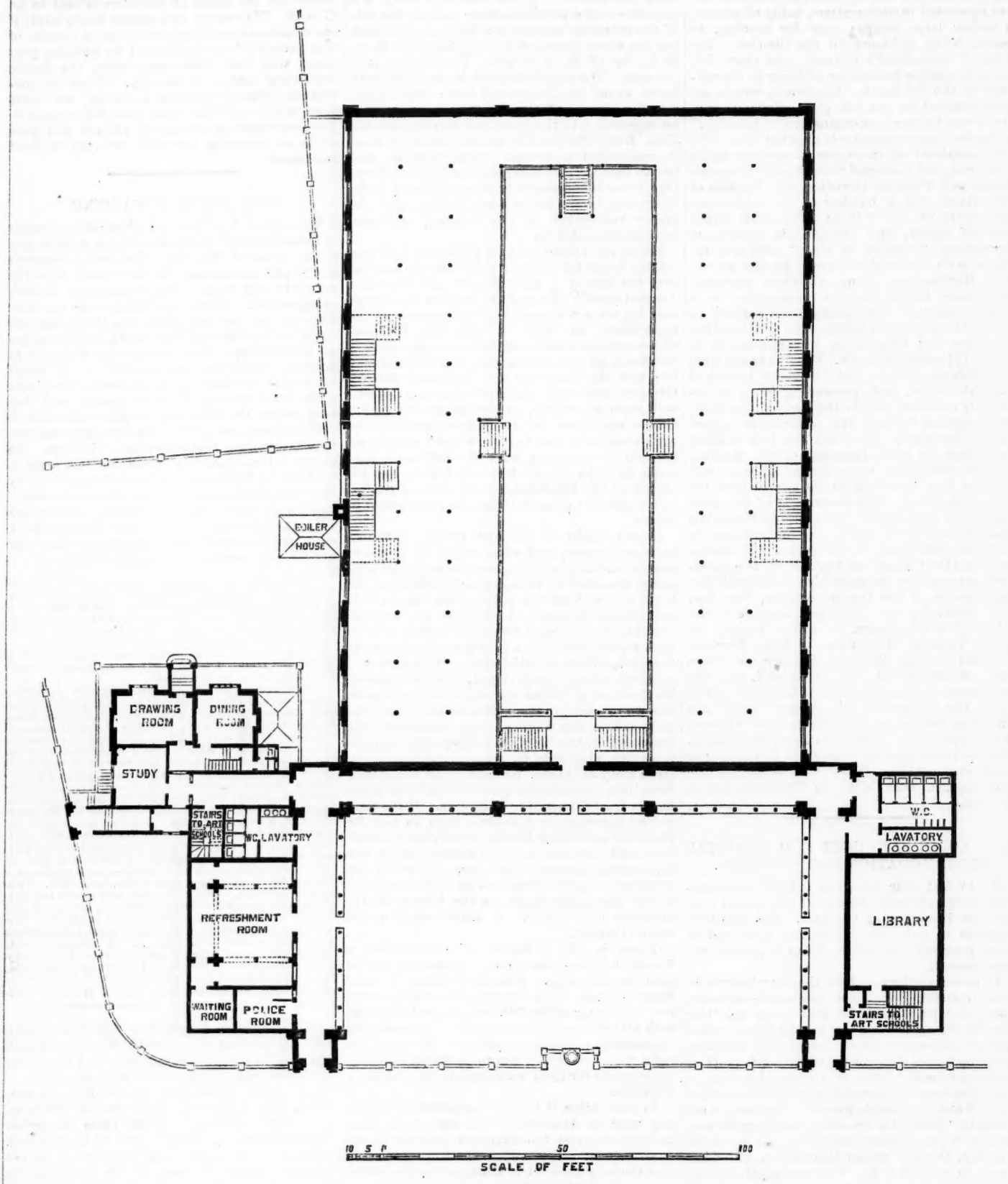
I have been so struck with the awful state of poverty, ignorance, and vice, in this part of London, that for the past fourteen months I have spent all my spare time, usually four days a week, in works of charity amongst the poor of this very locality; returning from time to time amongst my friends. I have represented to them the necessities of the place, and they have been most liberal in supplying me with money and clothing to distribute amongst the poor—most liberal, as regards their power of giving; but, of course, the amount thus privately collected has not been sufficient for the giant wants of a huge population. Besides the benefits thus distributed, I have opened a free day-school for the poor little children. This during the past year has been very well attended, and at Christmas I was able to give to each child some article of clothing — mostly boots, for the poor little children are, as a rule, barefooted. I am glad to say that, owing to the care and gentle teaching of our very excellent master and mistress, these poor outcast children are being rapidly civilised and tamed. We also have a night school for men and big lads; the average attendance is about 100 a night. . . . I have only to add, that I shall be most happy to act as steward of the bounty of any whose hearts have been touched by your article, and that cheques can be paid in to the account of the St. Agathe's Mission Fund, at Messrs. Hoare's, Fleet-street.

ROBERT LINKLATER, M.A."

Perhaps, after a perusal of the above, and a visit to some of the courts of Wapping Island, our East-end contemporary may feel regret for having penned his vulgar and vicious article.

An article in the *East London Observer* contrasts very favourably with that to which we have been referring. At the close the writer says,—"None, we imagine, will be bold enough to dispute the substantial correctness of the general picture of many of the homes of the poor,—not, alas! in Wapping Island only, but in all parts of the metropolis,—within a stone's throw of our principal streets and squares, and even of the seat of the Imperial legislature. And what can be done in the way of remedy? The St. George's vestry have never shown themselves indifferent to sanitary considerations, and it will not fail to be noted that some of the evils the *Builder* details are directly due to the action of the sanitary authorities. The vestry have, under a magistrate's order, obtained the closing of the houses in Plough-alley, as a measure of sanitary necessity; and what follows? The fever-stricken inhabitants crowd adjacent alleys. Is the remedy better than the disease, or worse? Let it be well noted, also, that the inhabitants of Wapping Island are perhaps exceptionally well off for labouring people. They are nearly all workers on the river, ballast-getters and ballast-heavers, coalheavers or coalwhippers, or porters at the waterside warehouses,—men whose toil is about the hardest, but whose pay is also about the best, of London labourers. It is precarious, and as it comes it goes; but there is more room for providence in Wapping Island than in most of our courts and alleys."

a



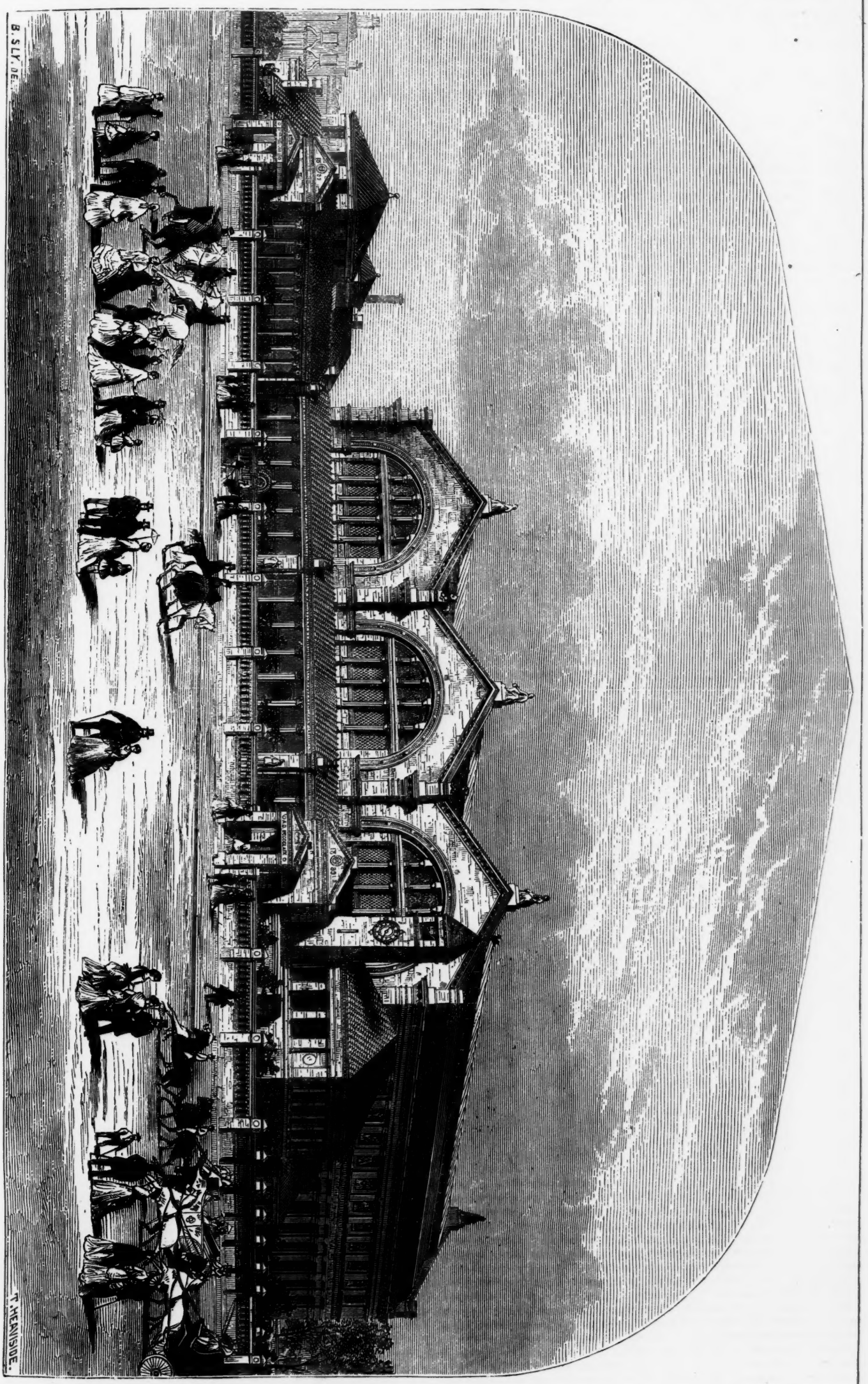
THE NEW MUSEUM, BETHNAL GREEN.

Plan.

WILHELMSHÖHE.

CIRCUMSTANCES having given this place a notoriety, our readers may be glad to have a few particulars of it. The palace of Wilhelmshöhe is built on the classic model, and, in its treatment, greatly reminds us of the works of Inigo Jones. It is oblong in plan, with two semicircular ends, and has a long range of offices on the left. It is approached by an Ionic portico, the six columns of which are raised above the ground line on twenty-six steps. In the centre of the building is a broad, but low lead-covered dome. The palace is five stories high, and has a balustered parapet. The Ionic capitals are after the style of those in the Coliseum at Rome. The construction of the portico is less singular abroad than it would be thought here. The shafts of the columns, instead of being monoliths, or composed of two or three stones only, consist of a great number of separate pieces, corresponding with the stone courses of the body of the building. Over each of the six columns is a wedge-shaped block of stone, with an intermediate stone lintel. This course of stones forms the architrave. The frieze, instead of having the stones jointed at right angles, consists of a series of stones radiating from centres, one series over the space between each column. On the frieze is carved, in incised letters, the single word, "WILHELMSHOEHE." The cornice is of the usual Ionic character, with dentils; but the plain tympanum is constructed in a very curious way. Immediately above the cornice (and in the tympanum) is another series of radiating stones, and above this are no less than three flush stone arches, which are perfectly useless, as there is nothing above to support. Several down-pipes unpleasantly obtrude themselves in very unfortunate places in the front,—one even follows the volute of one of the Ionic capitals of the antæ. The offices are joined on to the semicircular apse in an ugly manner, without any regard for the rest of the building.

Immediately in front of the palace are walks and flower-beds, and a beautiful and extensive lake, planted with firs, larches, and evergreen oaks, down to the water's edge.



THE EAST LONDON MUSEUM OF SCIENCE AND ART.

THE EAST LONDON MUSEUM OF SCIENCE AND ART.

OUR readers will remember, that after a conference, in 1865, as to the appropriation of the original building at South Kensington, christened by us as the Brompton Boilers before the design was carried into execution (in the hope of inducing the authorities to set up something less ugly), the Government agreed, on certain conditions, to erect a part of it in the East of London. One of these conditions was a freehold site, and this, through the exertions of Sir Antonio Brady, the Rev. Septimus Hansard, and others (the Corporation of London and the Fishmongers' Company being amongst the subscribers), was obtained in Bethnal Green; the title-deeds being presented to the Government by a deputation in February, 1869. On this occasion the deputation repeated the views of the promoters as to the nature of the museum which they wished to secure for the East End of London; their leading idea rightly being that it should be educational, in the strictest and widest sense of the term. All the subscriptions had been asked for, and given with that understanding; and in making over the land to the Government, the subscribers pressed these views on the consideration of the Government. As regards the study of art, they felt this to be a matter deeply affecting the trade and commerce of the country, and urged it as one of imperial necessity. What they desired was that the museum should be made subservient to technical education generally, and prove not only a blessing to the million at the East End, but a model educational institution for all provincial cities and centres of manufactures to imitate. Earl de Grey and Ripon, as President of the Council, in accepting the deeds, made it understood,—and it is desirable that this should be repeated,—that the museum is not a local but a national institution; that it will form as it were an outwork of the South Kensington establishment, and will be dealt with upon the principles on which the Committee of Council act with respect to the South Kensington Museum.

The site is a good one, some 4½ acres in extent, in the midst of a dense population, and thereon the building is being erected. The main body of it, about 185 ft. long, and 130 ft. wide, is now approaching completion, and we give in our present number a plan of it and a view of the entrance front. It has been built by Messrs. Perry & Co., under the direction of Lieut.-Col. Scott; Mr. James Wild, architect, mainly assisting in the design. The building is wholly of brick, moulded where necessary, and the arrangement of the front marks the tripartite plan. Within there are galleries in the two side divisions and at the end, lighted from the top. The central portion will have a mosaic pavement, made by the convicts at Woking and elsewhere.

Our illustrations show the complete design as proposed, with library on one side, refreshment-room and house on the other, with corridors leading to the road; but we understand that the Treasury has just now determined not to erect these,—at any rate, at present; the amount granted, 20,000*l.*, being nearly expended: absolutely necessary accommodation for attendants and so forth, is therefore to be provided in the basement of the main building.

We hope soon to hear that arrangements have been made for the completion of the building, and the establishment of a school of design and free public library in connexion with it. The value of such institutions can scarcely be overrated, and it is quite time that the long-neglected East End should be provided with them.

DESIGNERS AND OUR ART-SCHOOLS.

SIR,—I fear that our Schools of Design are in effect very much of a delusion and a snare to our manufacturers, who have a right to expect that their *employés*, who have been educated in Government Schools of Design, should be what they need; that is to say, *designers;* whereas few of the very best of them have been grounded in the indispensable rudiments of design. Mere clever draughtsmen or modellers (made so without having been taught the very A B C of fine-art design) can never do anything towards helping their employers out of the muddle of unconscious ignorance in which they are so generally "floundering about." Very many of the chief designers on the staffs of important firms of furniture manufacturers are totally unconscious of the meaning of the technical term "Order" in architecture, as "a system or assemblage of parts subject to certain uniform established proportions which are regulated by the office each has to perform." Can there, sir, be any doubt that the knowledge of *constructive necessities* generally, and of orders and styles, as established by instances of universally acknowledged excellence, are what a real art-education should be built upon? Surely it is a misnomer to call a collection of bits of *subordinate* decoration a "Grammar." A thorogh grounding in constructive proprieties and style-characteristics, is the only sure means of preserving art pupils from "decorative" anomalies and absurdities. J. H. M.

PUBLIC WORKS DEPARTMENT IN INDIA.

CASE OF THE CIVIL ENGINEERS.

SIR,—I wrote to you a short time ago, pointing out that the long-promised consolidation of pay and improvement of the position of the civil members of the Public Works Department had not yet taken place, although sanctioned by the Secretary of State. The measure in question has now been published, with effect from the 1st of September last, so that the Indian Government has virtually deprived every civil engineer in the Department of a year's increase of pay, or 60*l.* This is, however, not the only instance of the persistent determination of the Bengal Engineer officers who framed the new rules, to postpone, as long as they possibly can, justice to the civilians in the Department. I send you an extract from an article in the *Englishman,* the most influential Calcutta paper, with no particular bias in favour of civil engineers, which shows that our view of the matter is not a prejudiced one. The main features of the new rules are as follows:—

1. The pay of all civil engineers, up to Exec. engineer, first grade, is raised 60*l.* per annum. This is a boon certainly, but one not granted before it was necessary.

2. The above revised pay is made compulsorily applicable to all officers of the Indian army who entered the services after 1859 (Engineer officers always excepted). This will, I believe, cause a slight loss to only three officers now in the Department, and is so far unjust.

3. Older officers have the option of taking the new or the old rules. This is only just, as they entered the Department on different rates of pay, and could not now fairly be reduced.

4. All Royal Engineer officers, whether now in the Department, *or who may hereafter enter it,* or to be allowed the option of taking the old or the new rate of pay; if they elect for the latter, they are to receive their military pay in addition. The clause in italics is the one to which I take exception, and it is, I consider, a most unfair one, being conclusive evidence that the idea of justice to civilians was not present in the mind of the Indian Government, and that it was not their intention (as they professed in the circular I referred to in my former letter) to put civil engineers on the same footing as other members of the Department. It will, therefore, not be our fault if the ill-feeling so long fostered by the inequality of pay still continues to mar the *entente cordiale* of the two branches of the Department. As regards the clause granting engineer officers their military, in addition to their departmental pay, it is based on the old sophistical argument that it is a retaining fee paid them because they are liable to be called away on military duty. Now, sir (excluding the mutiny), about 5 per cent. of engineer officers in the Department have once in their term of service the chance of being called away from their civil duties for a year at the outside, during which time, I believe (although the rules on this point are purposely dark), they still receive their departmental pay; at any rate, no engineer officer has ever of late been a loser by his trip on military duty. The only fair rule would be to give engineer officers in the Public Works Department when on field service the civil consolidated pay, they being during their absence considered supernumeraries, just as officers on leave now are. This would be a great pecuniary gain to Government, and this course would have been adopted had it been the intention of the Indian Government and the Indian home council to do justice to us civilians.

Sir, I appeal through your columns to the council of the Institution of Civil Engineers; they have once already made the Indian Government eat their words, and if they will only take up the cause of their junior and helpless brethren in India, they have it in their power to obtain justice and equality for us, and it is more imperative than ever that they should do so now that such a very great extension of railways and other works is in contemplation.

Allow me, in conclusion, to make a few remarks on the new Civil Engineering College. The Indian Government found out that by their treatment they could no longer obtain the services in the lower grades of the Department of Public Works of the pupils of the best firms, and have had to content themselves lately principally with men who had had merely a scholastic training and a smattering of out-door work. They then tried to obtain skilled men in higher grades, but this has been found expensive and (owing to their ignorance of India and the language) not to answer so well as was anticipated, the new men not being sufficiently submissive to their often less skilled superiors. It has therefore been found necessary to establish this college, and one can only hope that the Government may turn out men to their liking. In the selection of the Principal a wise discretion has been shown, and it is to be hoped that the *alumni* will be taught official reticence and official veracity.

Allahabad. A CIVIL ENGINEER.

GAS-FLAME DENUDED OF ITS IMPURITIES.

SIR,—Having for a great many years held strongly the opinion that there *must* be something in chemistry, even though at present unknown, which, by proper application, should be capable of denuding gas-flame of its impurities, I collected the best books on chemistry, and sought to discover the exact properties of gas-flame. I then studied further, and found that almost all the constituent parts of gas-flame had the strongest and most marked affinity for *pure water.* I looked further, and I found that no other known ingredient had, in itself, such effect on these constituents as this simple, natural element. I therefore sought to bring pure water, or the stream of pure water, to bear upon gas-flame the moment the latter issued in the burner, into life. I employed various mechanics to make the machines which I drew for them, and having at last discovered the most effective mode of doing so, I have had this exceedingly cheap apparatus fitted up in every part of this house, consisting of four sitting-rooms and twelve bedrooms.

Water, or the steam or exhalation of water, entirely divests the gas-flame of the noxious acids and gases of which it is composed, and enables it to come out into a heat which all scientific and other persons who have seen and felt it here, pronounce to be "pure and delightful to inhale."

I have taken out no patent for it, being not in want of such adventitious aid; but I now freely give it to the public, the first means thereto being a letter to the *Builder.* I have also tried the action of gas-heat on various metals, and will merely add that no one should ever cause gas-heat to be evolved through iron or other metals, but through fire-clay or porcelain tubes; and that we all should further do "justice to gas" as we do to coal, by giving it a vent of some sort. No one ever sat in comfort by a coal fire in a room without the natural vent which we call a chimney, and no one should seek to heat his rooms with the heat of gas, however sweet and delicious it may be, without giving it a vent, of such kind as may naturally suggest itself. The quality of the heat here produced is, by test and ventilation, as pure as that evolved from coal, is without smell or effluvia, and is exceedingly agreeable to inhale. In the case of bedrooms, both those who are in health and those who are delicate sleep in perfect comfort. The price of obtaining this heat from gas, whether the gas itself or the apparatus, is, by experiment with coal, considerably lower. One of the first philosophical chemists in London, closely connected with the Royal Institution, wrote to me, after a description was given to him, as follows:—"I think you have certainly discovered the means for effecting this object, and on strictly scientific principles." Another equally distinguished person (both of whose names I will give) said, "The well-known principle you have taken for your guide has never yet been applied as you have applied it." To this I would parenthetically add that all works worthy of imitation are marked by Nature or by simplicity,—mine, by "*pure water.*" I had rather

not be called on to make any drawings. It is always difficult to show forth practical mechanics by written representations; but I open my house, heated in every part by gas, to every scientific or other person who may wish to see and to feel the "heat from gas flame, denuded of its impurity," any day from two to four o'clock. I, perhaps, ought to say that, not being a chemist or a mechanic, or a tradesman of any kind, I can offer nothing more than what is perceptible to the eye, the nose, the skin, and the lungs. I have now done; I need hardly add that I have not the most remote interest or benefit in thus making the above facts known, excepting the inward gratification of giving to others and to the public the same knowledge for practical good which I have, after much labour and expense, worked out for myself.

E. WARD JACKSON, J.P.

Royal Park, Clifton.

THE CHURCH OF ST. JAMES, MARYLEBONE.

THIS church, which is one of those built during the past century, in the very worst style, but substantially, has during the past year been placed in the hands of Mr. J. West Hugall, of Oxford, with a view to a remodelling of its details, and he has formed a chancel within the eastern end of the parallelogram, fitting up the whole of it with oak fittings. A reredos of stone, decorated in colour and gilding, is added. Stone columns, with carved capitals, have replaced square boxes supporting the galleries. The fronts of the galleries are now an open arcading instead of solid panelling. A stone arcade separates the vestry from the south aisle, instead of a wall, with folding doors, and all the high pews have been cut down, preparatory to the introduction of open benches of oak. Colour has been introduced, the object of the architect being to give a Byzantine character to the church. Further internal works are proposed, as well as an adaptation of the present "meeting-house character" of the west end, in Westmoreland-street.

Six memorial windows have been recently erected in this church. They contain single figures, nearly life-size, of St. John the Divine, St. James, Moses, Elias, St. Peter, and the Blessed Virgin. The groining of the arches and other decorations are surrounded with borderings. These restorations and improvements have been presented by the Rev. Sir Lionel Darell, bart.; and the windows were designed and executed by Mr. G. Rogers, of Worcester.

THE PRICE OF EARTHENWARE PIPES.

SIR,—I think it would be well to direct attention to a matter that appears not to be generally known. The prices of glazed earthenware pipes were some years ago adjusted to a uniform scale by common consent of the manufacturers, the selling prices being in each case adjusted by a discount on what is called the "Lambeth price list."

So long as this list was maintained as the standard, the system was understood and worked well; but it appears that absolute uniformity is not now preserved in the lists of all the manufacturers, and as tenders for the supply of pipes are nearly always framed on the discount allowed, it is clear that if the standard is changed much inconvenience and some loss may be the result.

S. E.

A TRIP THROUGH SOME OF THE COTTON GROWING DISTRICTS OF INDIA.

INDIA is beginning to reap the benefits of irrigation. A considerable quantity of exotic cotton-seeds has been sown in many parts of these districts, and is found to yield an average of 68 lb. per acre of cleaned staple. The market value of the exotic cotton is greater than that of the indigenous, but, from the want of proper machinery to clean it, two-thirds of it are wasted. The cotton-gins, if not kept in working order, hack the cotton; and the owners are, consequently, unable to obtain the price they would had the cotton been cleaned by proper machinery. If mechanical workshops were built, and roads made, the cotton-growers could get their goods brought to market at a reduced price compared with what now prevails. Besides, the cost of unpressed cotton is one-third more than when pressed, equal to a tax of 26 rupees per ton; therefore it only requires equation to prove that by a proper investment of capital in machinery very large profits would be realised.

The irrigation of southern India, where the people live near the equator, and, consequently, the physical exhaustion and the mortality are greater than in the north, should take precedence of that of the latter.

The best plan would be to hand over the irrigation to home contractors, who have a reputation to lose, and let them hammer away, instead of entrusting works which are a matter of life and death to the natives, to Messrs. Raumchander & Bàwnee Bàppoo, and other enterprisers, who, like the Arabs, are not remarkable for finishing anything they begin.

There should be a staff of sturdy navvies kept at every station to prevent the works from being obliterated from the landscape, like the bottomless tanks of Madras. It cannot be expected that the young English sahib, who frizzles in a tub of what the Neapolitan boatman poetically calls "burning water" in some jungle choudi until the sun goes down, can be expected to devote the necessary time to the construction of works. Although by such a tumàsha he may become a homœopathist, to understand agricultural engineering, according to home notions, would require quite a different process.

When the "heads of departments" make periodical inspections, they are followed by crowds of dancing-girls, to the stirring strains of "*Pinki, Pinki, Pànee.*" One could, by a stretch of the imaginative faculty, fancy that a scene from the "Arabian Nights" was being enacted. How fatally ignorant their mighty highnesses must be of the true state of affairs.

As a climax to my observations, the great wants of India are useful public works, machinery, and pure water for domestic purposes, as no European can avoid thinking of the water he drinks without grief, whilst the poor fire-worshipper stalks about muttering to himself, "Sahib, it is destiny." PIERSE ARTHUR.

HOLLOW-BRICK WALLS.

SIR,—Wishing to build a house for myself as cheaply as possible, and to combine strength and comfort in the greatest degree, I had intended to use concrete; but the gravel on the site not being very suitable, and bricks at the spot being cheap, I have been assured that hollow-brick walls will be as economical. Can any of your correspondents give me their experience in building such walls with iron or slate ties, such as Tutte's patent or any other? I object to using brick ties, because the main value of the hollow-brick system, besides its economy, is, that it secures a perfectly dry inner wall. But to do so the inner and outer walls must not be connected by *brick* ties, which will convey the moisture in vertical lines just as if the wall was solid brick, which in fact it becomes at the tie. What I require to know is, whether it is found, by experience, that two half-brick walls, 6 in. or 9 in. apart, and connected by ties, are sufficiently strong for the main walls of a two-story house (say 30 ft. high); or if two brick-on-edge walls, similarly tiled, could be safely used for the upper 10 ft., as the latter would use only half the number of bricks. ALFRED R. WALLACE.

CEMENT AND MURIATIC ACID.

SIR,—I have lately erected a bath lined with ordinary white glazed tiles, for the electro-chemical process (the patient being submersed in water acidulated with muriatic acid, and having a continual galvanic current passed through him), and although the tiles have been set and reset several times, the bath, which is the ordinary small one, leaks,—owing, I suppose, to the chemical action of the acid on the cement. I should feel greatly obliged if one of your correspondents would advise me what to do in the matter, or what cement to use. B. LETT.

LIABILITY UPON CONTRACT.

THE case of Henry Stych *v.* The Rev. Charles O'Neill Pratt has been decided at the Macclesfield County Court, to which it was brought from the Court of Queen's Bench.

In opening the case, the counsel for plaintiff stated that in 1868 the defendant had obtained, or it was supposed he had obtained, a grant from Queen Anne's Bounty Commissioners towards the erection of a parsonage at Dale Hall, Burslem. The plaintiff called on Mr. Pratt with reference to the plastering work; after the interview Mr. Pratt sent plaintiff an extract from the specifications, and he, in return, sent a list of prices, which the Rev. Mr. Pratt approved. Plaintiff thereupon sent his material to the place for the purpose of doing the work. However, Mr. Pratt said there must be but one contract for the whole of the work for submission to the Bounty Commissioners, and though there would be separate tenders for the plastering, building, carpentering, glazing, &c., they would all have to be included in one contract in the name of Mr. Burroughs, the builder. To carry out this arrangement, plaintiff was asked to send in a separate tender for the plastering work, which he sent in to Mr. Burroughs, who gave it to Mr. Pratt, and Mr. Pratt afterwards saw the plaintiff upon it, and told him he was very pleased with his tender, for it had saved him a sum of about 40*l.* After that the work was done, and was completed about ten months ago. It amounted altogether to 83*l.* under the contract, and to 9*l.* 15s. for extras not under the contract. Of the former amount there had been paid 42*l.*; and the present action was to recover the balance. There was a dispute as to who was liable, Mr. Pratt or Mr. Burroughs. He maintained that the liability rested on Mr. Pratt. His client had contracted with Mr. Pratt.

The plaintiff substantiated the counsel's statement.

The defendant's case was this. Mr. Stephens was the architect of the building, and drew up the necessary documents. The work was separately tendered for,—Mr. Boroughs, for the woodwork; Mr. Maydew, for the plumbing; and the plaintiff for the plastering. The Commissioners of Queen Anne's Bounty would not receive separate estimates for the work, but required that there should be one contract for the whole, and with the consent of all the parties tendering, Mr. Stephens drew up the contract produced, between Mr. Burroughs on the one part, and Mr. Pratt on the other part, in which Mr. Burroughs undertook the execution of the work tendered for, with the provision that extras should be paid as certified for by the architect. In confirmation of the contract several receipts were put in, showing payments to the plaintiff by Mr. Burroughs. The contention, in fact, was that the binding legal contract was only between Mr. Pratt and Mr. Burroughs, and not with each separate tradesman.

Mr. Stephens, the architect, Mr. Burroughs, the builder, and Mr. Maydew, the plumber, were called to prove Mr. Burroughs's responsibility under the agreement. The architect said, that under the agreement in question he held Mr. Burroughs responsible. Mr. Burroughs himself stated that he employed the other men, and was responsible to pay them as the money came in; and Mr. Maydew, the plumber, said that Mr. Burroughs was to be paymaster. In cross-examination, Mr. Burroughs stated, however, that he only considered himself responsible so far as concerned the payment proportionately of the money which came in. The money was to be raised by subscription and in different ways, and the plaintiff agreed to take his proportionate share. Pressed by plaintiff's counsel, to say whether, if no money had come, he would have considered himself liable to pay it out of his own pocket, witness said he supposed he ought. He admitted, however, that when plaintiff first applied to him, in October, 1869, he instructed his attorneys to say, "Your client (plaintiff) contracted with Mr. Pratt, and not with Mr. Burroughs. We only took the joiners' work. We have your client's tender, which you can see."

The judge, after remarking upon the conflicting evidence, gave a verdict for the plaintiff, with costs. He added, that he never knew an instance of a clergyman or a minister who did not get himself into a hobble if he had anything to do with business.

Mr. Mottram.—Because they think they can do it better than men of business; whereas none do it worse.

WEDNESBURY TOWN-HALL TENDERS.

AT last meeting of the local Board of Health, the subject of the tenders for the erection of the proposed new Town-hall was considered.

The Chairman said it was only fair to the public to state that the tenders were opened in the absence of the reporters because it was thought imprudent that the tenders should be exposed until the Board had decided upon one, and had it signed and sealed, they having found, when the tenders for the erection of the Public Offices were sent in, that, in consequence of the figures appearing in the papers the next morning, the person who had sent in the lowest tender refused to complete it, his figures being much below the next highest. The Board wished to avoid a like difficulty in this case, and, therefore, took the course to which reference had been made. On the tenders being opened, it was found that the figures were all above what had been expected, and then a question arose as to what was the duty of the Board with reference to the competing architects. Their clerk informed them that they had power to deal with the plans without reference to the other competitors, and Messrs. Loxton, the architects, informed them that it was quite common for plans to be cut down to meet a previous estimate. Amended tenders were then obtained, and the lowest—that of Mr. D. Moore, of Walsall—was brought down to a figure with which the Board thought they had a right to deal, viz., 2,325*l.* The cutting-down, which had been carried out to the extent of about 600*l.*, had been effected without violating the integrity of the building in any way, without affecting its utility, and in such a way as scarcely to affect its appearance. Such an outlay he did not think any reasonable person would object to, particularly as all the repairs (and they were extensive) necessary in the present offices were included in the estimate. He then produced a letter from Mr. Nichols, one of the competing architects, objecting to the course which the Board had taken, and the letter was read. The chairman afterwards proposed "that Mr. Moore's tender be accepted." The proposition was seconded by Mr. Blakemore, supported by Mr. Brown, and unanimously agreed to. The contract was then signed.

"EXPLOSION OF KITCHEN BOILERS."

SIR,—Referring to your report of the coroner's inquiry into the death of Eliza Clark, caused by the bursting of a kitchen boiler, I, feeling sure that, with the apparatus properly arranged, and ordinary caution used, such accidents would not often occur, am led to make the following remarks:—In fitting up a force boiler, to supply hot water to the upper part of a house, it is usual to fix an iron tank in the roof under the slates, the same being connected to the boiler by two iron pipes, with an escape-pipe from the top of the tank, which, when the apparatus is in working order, forms a safety-valve or escape for the steam, the mischief being caused by the pipes being stopped through the water freezing in them, which usually occurs in the upper part, on account of being most exposed, and this I suppose was the fact in the case referred to. What I wish to draw attention to is, that there should always be a draw-off pipe connected to the flow-pipe just above the top of the boiler, and continued to the side of the kitchen fireplace, with a tap in the centre of the chimney-jamb; so that it would be impossible, by drawing water from the tap, to empty the boiler, which would remain full, unless boiled away. Should the pipes become stopped by frost in winter, on going to the tap it would be discovered; and when the water ceases to run, by leaving the tap turned on, an escape is open from the boiler; the fire must then be let out and the pipes seen to, it being useless to try to melt the ice by the heat of the fire, the circulation of water being stopped. There is not the same opportunity of fitting a safety-valve as in a steam boiler, on account of the pressure of water to contend against, although I consider

one formed in the following manner would answer the purpose:—A float being made of copper, and hollow, similar to a ball cut in half, the flat upwards, with a spindle through the centre fitted with an india-rubber washer, working upwards from the inside of the boiler against a brass collar screwed into the top of the boiler, and standing up about 3 in., with a guide for the spindle to work through, the spindle having a nut on the top, and long enough to allow it to fall 1 in.; the boiler being full, the float or ball would press tightly upwards, and close the valve. Should the boiler lose water before the water could boil away very much, the pressure of the water in the tank being taken off, the valve would open even with the motion of the surface of the water, and explosion be impossible. EDW. J. DUDMAN.

CAPTAIN HEATH, R.N., in a letter to the *Times*, respecting the bursting of kitchen boilers, suggests the following precautions:—1. The circulating cistern should be placed as nearly as possible over its heating boiler, so as to avoid angles and levels in the circulating pipes. 2. The circulating pipes (connecting the boiler with the hot water cistern) should not be allowed to touch an outside wall, and they should be wrapped round throughout their length with non-conducting felt. 3. The circulating cistern should be covered with felt, and cased in with plank over the felt. The adoption of these suggestions will ensure safety even in the longest nights and the severest frosts to which the English climate is liable. It is true that they cannot all be carried out where the apparatus has been already fitted; but there are few cases where the cistern cannot be covered in, and that is the most important of the three suggestions.

THE TRADES MOVEMENT IN MANCHESTER.

A GENERAL meeting of the operative house-painters of both societies has been held, to receive the report of their arbitration committee on the proposed alterations on the working rules of the trade. It appears that the mayor's decision, at the Town-hall, in last April, namely, "That 7d. per hour be the minimum standard rate of wages in the trade," had left many matters of detail unsettled, and considerable dissatisfaction in the minds of the employers. According to rule, an arbitration committee was summoned in October last, consisting of six masters and six men. The masters had prepared a number of additions and alterations. The men, under the direction of their societies, had also prepared amendments and additions to the working rules. Many meetings were held to consider the different points in dispute, but an umpire had to be called in, in accordance with the rules. The County Court Judge, Mr. J. A. Russell, Q.C., accepted the appointment without fee or reward. The result, ratified by the arbitration committee of six masters and six men, as the agreement binding in the trade until further notice, is that some of the employers' amendments are embodied in the rules, and others rejected. The first rule makes 7d. per hour the minimum rate, without any recognition of inferior men.

HOUSE-BUILDING IN LIVERPOOL.

THE borough engineer, Mr. Newlands, has presented a report to the local health committee, in which he says:—The total number of dwelling-houses erected in 1870 was 1,241, thus classified:—Under 12*l.* annual rent, 15; from 12*l.* to 25*l.* annual rent, 1,102; from 25*l.* to 35*l.* annual rent, 87; from 35*l.* and upwards, 37. Of other buildings there were erected 89, thus classified:—Warehouses, 4; stables, smithies, and workshops, 46; public buildings, offices, manufactories, &c., 39. The number of alterations and additions to buildings was 334, of which there were of extensive character 59, and of inferior or trivial character 275. Of dangerous buildings, walls, chimneys, &c., taken down or secured, there were 212, thus classified:—Walls of buildings, 73; yard walls, 87; chimneys, 52. Number of houses built from 1841 to 1870 inclusive:—Houses under 12*l.* per annum, 6,473—per-centage, 14·03; above 12*l.* and under 25*l.*, 32,123—per-centage, 69·67; above 25*l.* and under 35*l.*, 4,855—per-centage, 10·53; at 35*l.* and upwards, 2,658—per-centage, 5·77.

Kingston-on-Thames Surveyorship.—Mr. Clement Dunscombe, M.A., C.E., late assistant engineer to Mr. Baldwin Latham, C.E., has been elected, out of 109 candidates, to fill the above post, vacant by the resignation of Mr. Slagg, C.E.

STREET TRAMWAYS.

AT the rooms of the Social Science Association, a paper has been read by Mr. John Noble, on "Street Tramways: ought they to be constructed by local governing bodies, or by private enterprise?" Dr. Brewer, M.P., occupied the chair. Mr. Noble urged the necessity of a royal commission being appointed to inquire into the subject, and determine whether it was better at once to authorise local bodies to undertake the construction of street tramways than conferring upon those bodies powers of purchase at the end of twenty-one years; and he further contended that the effect would be greatly to diminish the weight of the local burdens. A discussion ensued upon the paper, the chairman, who took part therein expressing a very decided opinion in opposition to a suggestion offered that the Government should, as they had done with the Post Office and the telegraphs, undertake the management and working of street tramways.——The Metropolitan Board of Works have adopted a long list of their committee's recommendations in favour of lines of tramway through the metropolitan thoroughfares to the city boundaries.——Mr. E. Allen, of Brompton, proposes to form tramway-rails of a Z shape, so as to be reversible.

CHURCH-BUILDING NEWS.

Smithfield, London.—An appeal in aid of the funds for the completion of the Smithfield Martyrs' Memorial Church, is made by the building committee. The foundation-stone of the building was laid by the Earl of Shaftesbury about twelve months since, in St. John-street, Clerkenwell, and the edifice is now completed, at a cost of about 8,000*l.*, but in consequence of between 2,000*l.* and 3,000*l.* yet remaining unpaid, the consecration, which was fixed for the 30th ult., has been indefinitely postponed. The style is Early Gothic, and the church has been built from the designs of Mr. Blackburn, architect. Seventeen statues of the principal martyrs have been placed on the outside, together with five bas-reliefs of scenes of martyrdom, and medallions of Tyndall, Wycliffe, and others; and round the walls inside are ornamented scrolls, in which are recorded the names, accusations, dates of death, and dying words of the 66 persons who were burned at Smithfield. The new district to which the church is assigned has been taken from St. James's, Clerkenwell, and contains a population of about 8,000, many of whom are of the very poorest. The new church will afford sitting accommodation for 1,000 persons, half the seats to be free.

Blackfriars-road, London. — Christ Church, which has been closed since July last, in order to undergo a thorough restoration and enlargement, has been re-opened for public worship. The interior of the building has been remodelled. The high pews have been replaced by low-backed ones. The accommodation in the galleries has also been considerably enlarged, while a chancel has been erected. The entire expense of the restoration and the new erection has been some 2,300*l.*, which had to be defrayed by voluntary contributions.

Howell (*Grantham*).—The parish church of St. Oswald, at Howell, has been re-opened for divine service. Howell is a small village, with a population of less than 100, distant about a mile and a half from Heckington. The church having fallen into a state requiring repair and reseating, efforts were made for its restoration. The sum of 500*l.* was raised, and under the direction of Mr. Kirk, of Sleaford, new roofs have been placed on the nave and chancel, and the whole of the church has been reseated.

Axminster.—The church has been re-opened after a restoration. The work has been confined to the interior of the building, and consists, principally, of the re-arrangement of the seats—the old pews having been removed and open benches substituted; also the removal of the west gallery, whereby the west window is thrown open; the removing of the organ therefrom to a ground-floor position in the chancel, and the destruction of the pulpit. Some years ago, the taste of the time besmeared the piers and arches dividing the aisles from the nave with blue paint, which has been scraped away, and the stonework is thus left in its original form. The original capitals, too, which were superseded with wood, have been replaced by stone, and carved from a pattern of one of the original designs. The organ, one of the few remaining built by Green, is now shortened from the "G" scale to the fashionable "C." The organ work has been done by Mr. Dicker, of Exeter. The windows have been re-glazed with lozenge panes. Two hagioscopes in the piers of the chancel arch, blocked, doubtless, since the Reformation, have been opened. The chancel has been paved with encaustic tiles supplied by Messrs. Maw & Co., of Broseley. The altar-table, made by Mr. Stone, of Axminster, is enclosed in an ornamental railing supported on iron standards. The vestment-room is now removed from the south end of the chancel to the opposite side. The entire gas fittings are new. The church is heated with an apparatus erected by Messrs. Brown, Brothers, of Lyme. The church will now accommodate about twenty more than formerly. The cost of the alterations will be about 1,100*l.* The contract was taken by Mr. Digby, of Ottery St. Mary, working from the plans of Mr. Ashworth, of Exeter, architect. The carving was executed by Mr. H. Hems, of Exeter, and the gas fittings were supplied by Mr. Worner, of London. The tiles within the altar were presented by Mrs. Matthias, and Mrs. Mallock intends filling up a window in the south aisle with stained glass. The old picture, "The Last Supper," is hung up in the south transept.

Great Doddington.—The parish church of Great Doddington, near Wellingborough, has been reopened for Divine worship after undergoing an extensive though not complete restoration. No professional architect has been employed, but the work has been carried out under the direct personal superintendence of the vicar of the parish, the Rev. Maze W. Gregory, whose aim has been, whilst restoring the ancient fabric, to preserve intact every architectural feature of the edifice. The repairs and "restorations," in the best sense of that misused word, have been made under the superintendence and by the direction of the vicar, and some interesting disclosures are the consequence. One traces very readily the original structure. It was a large Norman church, with a chancel full of small Norman windows with very deep splays. Some of these were wholly blocked up and lost until Mr. Gregory cleared away the accumulated whitewash and other obstructions; others were converted into Decorated windows. Rows of what looked like putlog-holes occur both in the lower and upper stages of the walls. But on examination they are seen to go completely through the wall, and to be finished masonry throughout. Their purpose is a puzzle. They give no light, and could scarcely be needed for ventilation, in such numbers especially. The chancel would have been a reasonably light one even in Norman times, when the east window was probably only the single small light, with a deep splay like those in the north and south walls. Against the chancel arch on the south-west side is a wall painting representing the Crucifixion, which Mr. Gregory, by whom it was discovered, has preserved. The design for the roof of the chancel was supplied by Messrs. Law & Sons, of Northampton, but it is only just to say that the design has not been carried out in its entirety. The whole of the work has been executed by Mr. Goodridge, builder, of Roade, under the supervision of the vicar. The cost of the chancel restoration has been about 400*l.*, the whole being defrayed by the Marquis of Northampton. The cost of the restoration of the nave is about 600*l.*, towards which his lordship gave a contribution, the rest being contributed by the vicar and farmers of the parish. A new roof is required for the north aisle, and some new seats for a portion of the church. For the further restoration some 200*l.* or 300*l.* will be required.

Gravesend.—All Saints' Church, Perry-street, has been consecrated by the Bishop of Rochester. The new church, which is in the centre of Northfleet, upon the side of a gentle slope, has been built on land presented by Col. Gladdish, and Mr. J. Edmeads, of the Hazels, Northfleet, who have also largely contributed towards the fabric of the church. The work was designed by Mr. James Brooks, of Lincoln's-inn, the architect of several churches lately erected in London. The edifice is built of Kentish rag, and the same material is displayed on the inside as well as the outside of the building. The style is that which prevailed in this country at the end of the thirteenth century. The church consists of nave, with north and south aisles; chancel with north and south aisles, and porch at the north-west angle of the building. A portion of the north chancel aisle is separated by a screen from the remainder to form a vestry, and has a separate entrance

from without. In addition to the porch doorway, there is an external doorway on the south side of the church. The bells are placed in a turret, above the chancel arch, and are arranged so that they may be rung from the steps at the entrance to the choir. The nave is separated from the aisles by an arcade, of four bays on each side; and an arch of wide span at the back of the choir-seats on north and south sides of the chancel, separates the latter from the chancel aisles. The windows are principally of plain lancet character, though we must except the wheel window in the west gable, and the east window of the chancel, which contains geometrical tracery and moulded jambs and arch-stones. The east window is filled with painted glass, executed by Messrs. Clayton & Bell, of London, and contributed by Mr. G. Jones, of Rosherville. "Our Lord in Majesty" forms the centre of the window, the lower part being filled with groups of saints and Old Testament characters. In the upper portion are two angels, and a representation of the "Agnus Dei." A painted window from the same *atelier* has also been placed in the south wall of the church; the subject is the raising of Lazarus. All the other windows are filled with glass of cathedral tint, in lead quarries. The doorways are treated in conformity with the style of the building, and that at the principal entrance is moulded. All are fitted with oak doors, with hinges of iron-work specially made for each. The roofs throughout have their timbers exposed to view, the ceilings being formed between the rafters, which are stained and varnished. The exterior is covered with tiles, principally of Staffordshire manufacture. The seats are throughout open, and of deal stained and varnished, and are free and unappropriated. In the wall over the chancel arch has been inserted a device containing the emblem of the cross, formed with Bath stone and inlays of tiles. The several gangways of the church have been formed with Staffordshire red and black paving-tiles laid in patterns. The chancel has, however, been paved with Minton's tiles. Arrangements are made for heating the building by means of an apparatus placed in a vault at the west end, and sunk slightly below the paving. Gratings placed in various parts of the church will deliver the warm air. The font is of marble and alabaster; it is designed in harmony with the rest of the church. It is placed at the west end of the central gangway of the nave, and is from the hands of Messrs. Burke & Co., of Regent-street. It was a special offering to the church. The pulpit is also composed of marble and alabaster; it is simple, and is the offering of the Brenchley family, who have also contributed most liberally to the endowment and building fund. The extreme length of the edifice within the walls is 103 ft., the greatest width 42 ft., and the heigh from floor to ridge of nave roof 49 ft. All the works, excepting in some few particulars, have been executed by Mr. Thomas Blake, of Gravesend, builder, under the superintendence of the architect.

Horsell.—The church of Horsell has been reopened, after undergoing a restoration. The church is of ancient date, for the register dates back as far as 1656, and had become much dilapidated by time. The internal arrangements of the church, apart from the condition of the building, were not suited to the wants or comfort of the congregation; and some time since the Rev. Albert Mangles, the vicar, set about the restoration. He became his own architect, but received assistance from Mr. James Harris, of Woking Station, a church-builder, to whom the work was given to do. The old high pews on the north side of the nave have been removed and replaced with low stained deal seats to correspond with other seats of the church; the old-fashioned high seats in the chancel have been taken down, and stalls substituted for them, the whole being of stained deal. An altar-rail has been placed in front of the chancel. The chancel itself has been paved with tesselated tiles, black and red alternately. The communion-table is covered with green cloth, while on either side, on the wall, the commandments are illuminated. Above it are the words, similarly done, "This do in remembrance of Me." A new stone window has been placed in this, the east end of the chancel, filled with stained glass, and having in the centre a medallion of the Virgin and Child. It was manufactured by Messrs. Powell, of Whitefriars. The window is the gift of the Rev. Albert Mangles. A new window of stained glass has also been added to the north side of the chancel. The passages of the nave and aisle are paved with black and red tiles in alternate arrangement. The walls have all been scraped, the unsightly plastering removed, and stucco substituted. The window dressings have all been cleaned, and the windows in the nave and aisle have been re-glazed with cathedral quarries. A new porch has been added to the south side of the chancel. The church is heated with a hot-water apparatus, erected by Mr. Smith, of Bramley. It is said to be intended in time to repair the tower when the funds will admit of it.

Books Received.

Preliminary Experiments on the Mechanical and other Properties of Steel; made or collected by a Committee of Civil Engineers. London: Adams, Brothers, Printers, Little Tower-street, E.C. 1868.

Experiments on the Mechanical and other Properties of Steel; made at her Majesty's Dockyard, Woolwich. By a Committee of Civil Engineers. London: Adams, Brothers. 1870.

THE results of these experiments, the first part of which is dated in 1868, are now in a printed form. They are chiefly tabular, and bound up in one volume.

The committee under whose superintendence the experiments have been carried out by Mr. Kirkaldy, and collected from other sources, consisted of Messrs. W. H. Barlow, George Berkley, John Fowler, Douglas Galton, C.B., and J. Scott Russell. Mr. Berkley acted as secretary, and Mr. W. Parsey as assistant secretary. The contributors to the fund wherewith the expenses were met were Messrs. Bessemer & Co., John Brown & Co., the Barron Hematite Steel Company, the Bolton Iron and Steel Company, Charles Cammell & Co., Krupp & Co., Lloyds, Fosters, & Co., the Monkbridge Iron and Steel Company, Naylor, Vickers, & Co., and T. Turton & Sons. The arrangements were made to test the resistance of steel to tension, compression, transverse strain, and torsion. The second part relates to experiments on tension and compression carried out at Woolwich Dockyard, by permission of the Admiralty. The work contains experiments also on riveted joints, and a chemical analysis of certain bars, whose elasticity and ultimate strength are also given.

VARIORUM.

"A YEAR'S Voluntary Evangelising Work among the Costermongers in Golden-lane, under the superintendence of W. J. Orsman, 1870. London: Passmore & Alabaster, Paternoster-row." The state of the Golden-lane district is not new to readers of the *Builder*, and it is satisfactory to us to find a humanising and improving work of any kind going on amongst its poverty-stricken denizens. The "mission" under Mr. Orsman's superintendence is presided over by the Earl of Shaftesbury, and carried on only "after office hours;" yet much good work seems to be done. Over and above the usual secular and religious education, weekly lectures are given, and the poor people are cheered up by the tonic sol-fa music, in which they seem to take special interest. They often get comfortable meals from the Mission, and are taught to sew their ragged clothing. On this last useful subject, Mr. Orsman says:—"As they unfortunately possess only a single suit, the meeting is, of necessity, strictly private." There are costermongers' tea-parties, too, the sick are visited, and much good is done in various ways.——"Second Annual Report of the Coventry Free Public Library." 1870. Coventry: Hickling, Earl-street, Printer. During the past year 61,076 volumes have been issued in 307 days rom this library, giving a daily average of 198. f66 tickets have been granted, making the total number of borrowers, 4,038; of this number, about 1,000, it may be estimated, do not avail themselves of their right of borrowing books from the library.——"The Quarterly Journal of the Amateur Mechanical Society. Hon. Editor, Rev. J. Lukin. January, 1871. Trübner & Co." This is the first number of a new journal, of a new society. Lathe works form the chief subject of the present issue. There are also an introduction; papers on the "Rise and Progress of the Society;" on "Mensuration and Enumeration of the Impalpable and Invisible," by the Editor; on "Breach-loading Fire-arms," and Others; and the journal is illustrated by engravings.——"The Australian Handbook and Almanac for 1871. Second year of issue. Gordon & Gotch, Holborn." There is a good deal of information as to Australia in this Almanac, but a great want of more. We should like to see each succeeding issue a decided improvement on its predecessors; but we do not see much trace of that in the present instance. The printing is not very careful either. A map of Australia accompanies it, showing routes of explorers, &c.

Miscellanea.

The Proposed New Engineering College.—A deputation from University College, London, consisting of Mr. George Grote, the president; the Hon. George Denman, M.P.; Mr. Julian Goldsmid, M.P.; and Dr. Storrar, members of the council: Professor Fuller, C.E.; Professor Williamson, F.R.S.; and Mr. J. Robson, the secretary; has waited upon the Duke of Argyll, at the India Office, to present a memorial from the council and the senate of the college, on the subject of the proposed institution of a new engineering college for the Indian service. The interview with his grace lasted upwards of an hour. The memorialists consider that the deficiency in the present system has arisen, not from any defect in the existing places of education, but from the injudicious system of examinations hitherto pursued, and from a want of sufficient inducements to well-qualified men to enter on the career proposed to them. The memorialists assume that the latter cause is recognised by the Government, for it is understood that it is in contemplation to augment considerably the salary upon which a civil engineer in the service of the Indian Government will hereafter commence his work. The memorialists believe the proposed college will be prejudicial to the public service by narrowing the field for the selection of candidates, and by limiting their means of obtaining the requisite instruction. They submit that the working of Government colleges has not been such as to recommend the creation of a new Government college, having practically the monopoly of appointments, and protected from competition. They suggest that such a step is at variance with the plan for throwing open to all her Majesty's subjects the opportunity of gaining Government appointments.

Railway Property Last Year and This. The *Railway News* thinks that nothing but some unforeseen turn in politics can prevent a general advance of the value of railway property during the present year. Trade is good, and promises to progress, whether we have peace or continued war. Money is cheap, traffics are expanding, and in most cases a very decided increase of dividend will be paid next month. Confidence in railway property is increased by the attention paid to railway accounts. A table of the weekly receipts of railways in the United Kingdom for the seven years ending December 31st last, is given in *Herepath's Journal*. The increase in the total traffic of 1870 over that of 1869 was 2,100,000*l*. For the past year the total weekly receipts amounted to 43,126,604*l*.; for the year 1869, to 41,025,661*l*., showing an increase of 2,100,944*l*. In the past seven years the published weekly traffic receipts showed an aggregate increase of 12,172,600*l*., or an average annual increase of 1,738,943*l*. The inference drawn from these figures is that there never was so promising a period as the present for railway property. All the great trunk lines are made; the capital accounts of the companies are practically closed, excepting for additional rolling stock and other accommodation for the increasing traffic.

The Unseaworthiness of Ships. — Mr. Plimsoll, one of the members for Derby, has twice addressed the public in the Free Trade Hall, Manchester, on the condition of our merchant seamen, with especial reference to the practice of sending out unseaworthy ships; and, at a public meeting of the inhabitants since held in the Free Trade Hall, the subject was considered with reference to Mr. Plimsoll's two addresses, and also as to the propriety of petitioning Parliament, when it was resolved,—

"That this meeting deeply deplores the sad fact that, annually, about one thousand of our merchant seamen, the great proportion of them being married men, lose their lives in wrecks upon our coasts; and as it is found that fully half of that number is traceable to vessels which are unseaworthy and overladen, Parliament shall be asked to enact a law, in its next session, to prevent such vessels from going to sea."

Opening of a New Infirmary at Southport.—A new infirmary and local dispensary, recently erected in Virginia-street, Southport, has been formally opened for the reception of patients and the use of the public of that town. The building comprises, on the ground-floor, surgery, dispensary, consulting-room, surgeons' sitting-room, kitchen, scullery, pantry, &c.; also one male and one fever ward, each containing 7,280 cubical feet, and affording accommodation for six patients; there are also adjoining the above wards, nurses' scullery, nurses' bedroom, two lavatories, two water-closets, and other conveniences, all of which are one story in height, and effectually shut off from the main portion of the building by means of well-ventilated corridors, and are approached on the outside by a separate entrance. The upper floor contains surgeon's bedrooms, three nurses' and servants' bedrooms, two bath-rooms, two water-closets, nurses' scullery, one male and one female accident or non-infectious disease ward, the cubical capacity of each ward being 7,280 feet, and capable of accommodating six patients, the same being ventilated by means of six windows, 7 ft. by 3 ft. 6 in. from ceiling downwards, placed directly opposite each other, and containing pivoted apartments at the top to open with rope pulls, &c.

The Law and the State of House Property.—The Metropolitan Board of Works has had before it the question as to whether the owners of house property in London ought to be permitted "to do as they like with their own." At the instance of Mr. Lloyd, it was referred to the Parliamentary Committee to consider whether or not some legislation ought to be promoted with a view to enabling the Board to deal with property allowed by its owners to become an eyesore and an injury to the neighbourhood in which it is situated. Some dwellings in Stamford-street, Blackfriars, for example, have long remained in an unoccupied and uninhabitable state, without any attempt being made to let or improve them. Mr. Lloyd remarked that the roughs resident in and about the neighbourhood conceived they had as much right to inherit the unoccupied premises as rats and mice, and proceeded to take possession; but the authority of the law was invoked by the eccentric landlady to eject and punish the intruders; and Mr. Lloyd thinks that the law which protects owners should be invoked to secure the interests of neighbours. Stamford-street is not the only neighbourhood which suffers from a similar cause.

Doncaster Co-operative Soiree. — The annual festival in connexion with the Doncaster Mutual and Improvement Society has been held at the Guildhall. About 500 of the members and friends sat down to tea, after which the secretary read the annual report, which stated that co-operation in Doncaster had made a strong impression upon the public. At the end of 1869 the share capital amounted to 260*l.* 19s. 9d., but at the end of 1870 it had increased to 772*l.* 17s. 7d. The amount received for goods in 1869 was 2,049*l.* 18s., and at the end of 1870, 8,042*l.* 0s. 4d. The disposable net profits in 1869 were 151*l.* 16s. 3d., and in 1870, 695*l.* 11s. 1d. Since the society had been established they had turned over thousands of pounds, and the secretary said he thought that if individuals could accumulate wealth from the profits of working men's outlays, it was high time that the working men themselves put their profits into their own pockets, and this they might do by co-operating amongst themselves. Co-operation was destined and would ultimately overthrow individual interest, for the good of the great body of mankind.

Art Workmanship Competition, Society of Arts.—The works sent in competition for the handsome premiums offered by the Society of Arts are about to be exhibited to the members. Although the collection includes some productions of considerable merit, it is scarcely such a response as might have been expected. The judges invited by the Council,—viz., Sir Digby Wyatt, Mr. H. A. Bowler, Mr. R. Redgrave, R.A., and Mr. Godwin,—will meet next week to consider their award.

Institution of Engineers in Scotland.—The Transactions of the fourteenth session, 1870-71, of this Institution have been published, at their offices, in Renfield-street, Glasgow. The issue contains a report of the continuation of a discussion on a paper "On the Education of the Mining Engineer," by Professor John Young, M.D.

The Early Monument in Lough. — At the last meeting of the Newcastle Society of Antiquaries, Dr. Charlton read a paper on the interesting archæological discovery made at Greenmount, on Lord Rathdonnel's estate in Gormanstown, in the county of Lough, Ireland, as already noticed in the *Builder*. There was an old tradition, he remarked, and it was not an unfrequent one in Ireland, that the mounds in that vicinity covered the remains of the Danish invaders of the country. The mound was found to consist of the materials of the ancient sea-beach. About 11 ft. from the top of the excavations, a small bronze plate, which had been attached to a sword-belt, was found. On one side the plate bore, in clear and well-defined Runic characters, in the Norse type, the inscription, "Domhnal Sealshead owns this sword." Domhnal being a well-known Irish equivalent to the Scottish name Donald, he thought that they might conclude that one Donald, surnamed Sealshead, wrote, or caused to be engraved, these words on the ornament to his sword-belt. In all probability, he thought, the Donald here referred to had been an ally or the friend of the Danish invaders.

Monumental.—The south aisle of the choir of York Minster has many mural monuments, and another has just been added. The monument is in memory of the officers and men belonging to the 33rd Regiment, who died when in India and in Abyssinia, and is erected by the officers of that regiment. Upon a large polished slab of dark grey marble, nearly black, is affixed a tablet of Parian marble, the summit of which is circular in shape, and has round it, in gilt letters, "The Duke of Wellington's Regiment," below which, also in gilt, are the figures 33 of large size, and encircled within a sculptured wreath of evergreens, with the motto of the regiment, "Virtutis Fortuna Comes." Below this a carved bordering runs across the tablet, and then are cut on the marble the names of officers and men. Above the tablet, on a ribbon, is inscribed, "1st York West Riding," and on each side of it are similar ribbons, having upon them the words Seringapatam, Waterloo, Alma, Inkerman, Sebastopol, and Abyssinia. The sculptor was Mr. Gaffin, of London.

Co-operative Stores (Knightsbridge Branch).—At the last meeting of the Westminster District Board of Works, Mr. Z. D. Berry in the chair, a letter was read from the superintending architect of the Metropolitan Board stating that the application of Mr. Thomas Dudley for permission to erect an open covered way in front of 19, Albert-terrace, Knightsbridge (the office of the stores), had been refused. A further letter was read from the superintending architect (Mr. Vulliamy) setting out that notwithstanding this refusal, the works were being proceeded with, and calling on the District Board to enforce the removal of the projection. It appeared that Mr. Dudley received an intimation of the refusal three weeks ago. The Board now decided to inform him that if the work of demolition is not begun on or before the 23rd inst., the solicitor and the surveyor will be instructed to take the necessary steps to insure the removal of the projection.

The Oxford Surveyorship.—Mr. Thomas C. Clarke, the surveyor to the Local Board, having got a lucrative appointment in Peru, has resigned his office at Oxford. The Board have expressed their regret for the loss of his services, especially in the present position of the drainage question. One member said their proper course would be to advertise for a surveyor, in accordance with the terms of former advertisements; and if the Board should not be fortunate enough to secure the services of a gentleman equal to Mr. Clarke's abilities, they would then adopt a course to meet their requirements, so as to be able to carry out their drainage works. The question of an assistant was not, however, before them. The chairman then put the motion, and it was carried, the terms of the advertisement being agreed upon, the Oxford papers and the *Builder* being chosen in which the advertisement should appear.

Chromolithography.—Messrs. Nicholson & Son, of Bradford, have published an Allegorical Sheet Almanac for 1871, which is a remarkably good specimen of chromolithography. It is from a design by Mr. Edward Corbould. The drapery of the Angels censing the new born year is particularly well reproduced. The sheet is the result of at least twenty printings.

Fall of a Warehouse in Liverpool.—Alarm and excitement have been created in Formby-street and its neighbourhood by the sudden falling of the west wall of the large iron warehouse of Messrs. Bailey & Co., extensive iron merchants. The warehouse is situated in close contiguity to the Waterloo Dock Station of the London and North-Western Railway Company, who are making an extension of the station in question. In the course of their operations, large excavations have to be made, and these are in progress. Following the course of the intended works, a portion of the required excavation had been brought within 5 ft. or 6 ft. of the warehouse wall, without any indication of immediate danger; but the foundation suddenly gave way, the wall falling into the cutting. The wall was about 30 ft. high, and the fallen portion leaves a gap for the whole of that height, and about 40 ft. in width. No one was hurt. The warehouse at one time contained about 200,000 tons of iron.

Value of Building Sites, Lincoln.—Last week, Mr. R. Hall offered for sale in the Corn Exchange, Lincoln, a number of building sites, in the parish of St. Swithin. The following is a list of the sales effected:—Lot 1, at 3s. 3d. per yard, Mr. J. Sivil; lots 3 and 4, containing respectively 436 and 406 yards of building land, 5s. per yard, Mr. Tweed; lots 5 and 6, building land fronting Montague-street; 5s. per yard, Mr. Sivil; lot 7, at 5s. 9d. per yard, Mr. Squire Whitworth; lot 8, 3s. 6d., Mr. Goulson; lot 9, 3s. 6d., Mr. H. Fotherby, and lot 10, 3s. 9d., to the same gentleman; Messrs. Martin & Sims bought lots 11 to 16 inclusive, at 4s. 3d.; lot 17 fell to Mr. Fotherby, at 3s. 6d.; Mr. Cullen bought lot 18, at 3s. 7d.; Mr. Wistow bought lots 19 to 22 inclusive, at the same price; lot 23, at 3s. 7d., and lot 24, at 3s. 6d., fell to Mr. Tweed; Mr. H. Barnes bought lots 25 to 31, inclusive, at 3s. 6d.; lot 32, at 4s., went to Mr. J. Spencer, who also bought lot 33, at 4s. 6d.; Mr. Henry Goddard gave 4s. 3d. per yard for lots 34 to 40 inclusive.

Cement Testing Machine.—We have received particulars of a cement testing machine, said to possess many advantages over those ordinarily used. The general idea of its construction originated with M. Michele, but all the details were worked out by Mr. Carrington. By turning a hand-wheel a clip, holding the cement to be tested, is drawn down, and thus a tensile strain is exerted on the block or brick, which increases as the weights are raised, until a fracture takes place, when the weights fall, leaving the pointer indicating on the segment the exact maximum strain withstood. What is claimed for the invention is that it will apply a regularly increasing strain without any jerk, that it is of convenient size, and that it can be purchased at a moderate price. One has lately been obtained for their London tests by Messrs. Francis & Co., cement manufacturers, and it may be seen at work at their office, Vauxhall Bridge.

The Royal Historical and Archæological Association of Ireland.—The annual general meeting of this Association (formerly the Kilkenny Archæological Society) has been held at Butler House, Kilkenny. Mr. Eugene Shine in the chair. The report of the committee for the year 1870 stated that the number of new Fellows and members elected during the year, amounted to 75, and the entire roll, on December 31st, extended to 692 names, showing an increase of 10 in the year. Fifty-nine members were lost by death or resignation during the year, and six have been removed from the list. Sixteen new members and three Fellows were elected at the meeting.

Lead Poisoning. — The subject of lead poisoning by the domestic use of lead pipes for water is forcing itself on attention in America. The *Boston Journal of Chemistry* calls attention to the tin-lined pipes which have come into use there, and against which it emphatically warns its readers: 1st, because tin by itself is often more readily attached and dissolved by water than is lead; and 2nd, that when placed in association with lead, if any water contact is made between the tin and lead, both metals are dissolved with increased rapidity.

A Trades Insurance Company.—Suggestions have been circulated, and a meeting has been held, promotive of the establishment of a special company for the more equitable assessment of premiums for the insurance of manufacturing and business premises against loss or damage by fire.

Pictures on Hospital Walls.—The Royal Hospital for Incurables at Putney has, through the liberality of one of its warmest supporters, become what may not inappropriately be termed a "picture gallery." The *Art Journal* says,—A gentleman—one whose delight is to "do good by stealth," and would therefore not care to see his name publicly associated with an act of most thoughtful benevolence, though we may be allowed to speak of him as the "treasurer" of the hospital—has presented to it as many as 400 chromolithographs of the best kind, which he has had put into handsome frames, and hung round the walls of every apartment in the building where the afflicted patients lie helpless; or, if able to move about, where they are accustomed to assemble. It is not easy to imagine with what pleasure these beautiful transcripts of nature are viewed by the inmates, not a few of whom are incapable of seeing anything beyond the walls of the rooms in which, amid pain and suffering, they are, in all probability, destined to pass their wearisome lives.

Nottingham Free Library.—The third report of this institution states that it has attained to a fifth rank amongst the free libraries of the United Kingdom, in point of issues, though only one department is yet in active operation. A newsroom and a small reference library have been formed. The lending library contains 12,455 volumes. The issues were 135,272 volumes. The magnificent work on the textile fabrics of India, now in preparation by Government, has been subscribed for at a cost of 150*l.*, which is only the actual cost of production; the materials, as samples, being supplied by Government, at a cost to them of from one to four guineas a yard. The museum has been very greatly improved by the arrangement of several of its divisions. The committee urge the necessity of providing larger and more convenient premises, in which the library and museum could be embraced.

Chelsea Improvements.—At the Chelsea Vestry, on Tuesday, on letters being read from the superintending architect of the Metropolitan Board, stating that permission had been asked to form certain new roads on the Ashburnham estate (near Cremorne Gardens), and also to form three new streets, two continuations, and two mews, on Lord Cadogan's estate, lying between Flood-street and Smith-street, King's-road, Chelsea, the surveyor reported that it was proposed to put 218 buildings on the land, including ten stables, which would increase the rateable value very considerably. He recommended that the Metropolitan Board should be advised to grant the application. This was agreed to, on the motion of Mr. E. O. Symons, seconded by Mr. Fisher.

New York Crystal Palace. — New York advices describe a project in course of introduction for a 'grand Crystal Palace in that city, — "a palace so inconceivably huge," according to the *Journal of Commerce*, "that, in the language of a prospectus, the crystal structure of 1851 was only a toy-house compared with it. It is to occupy about 23 acres, and the capital stock proposed to be created is 1,200,000*l.* A dollar per square foot is to be the charge for space to exhibitors, and the price for single admissions is to be half a dollar. The site chosen is stated to be at a disadvantageous point, 'far removed from the hotels and the populous parts of the city.'"

Holdenby House.—The remaining portion of this historical mansion is now being restored and adapted as a residence by the trustees of the late Viscount Clifden. It was one of the best works of the great Elizabethan architect, John Thorpe, the builder of Burleigh, Audley End, Hatfield, Kirby, &c., and was erected for Sir Christopher Hatton about 1583. It had two great quadrangles, with its principal façade towards the south, in front of which was a terrace called King Charles's-walk, with a large bowling-green, flanked by terraces on each side, formed on the slope of the hill, and overlooking the valley and woods of Lord Spencer's park at Althorp.

The Sanitary State of Camborne.—Dr. Buchanan has issued his report on the sanitary condition of Camborne, which he considers will help the spread of any epidemic. The water-supply has been miserable; drainage is practically non-existent; nuisances abound; overcrowding prevails; the inhabitants are by no means concerned about all this, and the local authorities are in about the same state of feeling.

The Lead Trade.—Some large purchases of pig lead have been made by some of the principal houses within the last few days, and the smelters have also secured all the ore they could obtain. There are reasons to anticipate that this metal will bear a more remunerative price during 1871 than for the last year.

TENDERS.

For works in Water-lane, Blackfriars, for Messrs. Spiers & Pond. Mr. E. Power, architect. Quantities supplied by Mr. A. Peebles:—

	No. 1 Contract.	No. 2 Contract.	Deductions from No. 2.
Garland	£1,645	£3,552	£213
Barnett & Whichelow	1,520	2,850	95
Turner & Sons	1,406	2,888	174
Hill & Sons	1,390	3,118	141
Jackson & Shaw	1,312	2,537	88
Colls & Sons	1,278	2,578	130
Brass	1,265	2,703	198
Nightingale	1,263	2,754	177
Merritt & Ashby	1,259	2,563	138
Newman & Mann	1,255	2,826	215
Nelson	1,242	2,710	216
Henshaw	1,217	2,624	131
Perry, Bros.	1,208	2,898	276
Bracher & Son	1,200	2,800	183
Foster	1,199	2,563	155
Browne & Robinson	1,197	2,573	147
Sewell & Son	1,193	2,589	173
Aviss & Co.	1,174	2,625	165

For the restoration of Matlock Church, Derbyshire. Mr. Benjamin Wilson, architect. Exclusive of old materials:—

Statham	£1,580 0 0
Brown & Sharp	1,568 0 0
Thompson	1,500 0 0
Bridge (accepted)	1,290 0 0

For sinking a well 80 yards deep, for the Alfreton Local Board of Health. Mr. Benjamin Wilson, surveyor:—

	Per Yard lineal.
Farnsworth	£30 0 0
Nicholls	7 7 0
Alderson	4 18 0
Haslam	4 5 0

For alterations and additions to Binn's Hotel, Harrowgate. Mr. Benjamin Wilson, architect:—

Winterburn	£1,354 0 0
Benson	1,345 0 0
Simpson (accepted)	1,250 0 0

For the erection of additional Infants' School to St. Paul's School, Derby. Mr. Benjamin Wilson, architect:—

Thompson (accepted)	£482 0 0

Accepted for new school at Leek, Staffordshire. Mr. Benjamin Wilson, architect:—

Mason's Work.	
Barlow	£160 0 0
Bricklayer's Work.	
Grace	260 0 0
Joiner's Work.	
Mackrell	181 10 0
Plumber's Work.	
Johnson	73 19 0

For the erection of a Pavilion, with conservatories, in the Public Gardens, at Buxton. Mr. E. Milner, architect:—

Hall & Son	£9,495 0 0
Vernon & Capper	8,701 0 0
Clarke & Hope	7,800 0 0
Cumming & Edwards	7,700 0 0
Haigh & Co.	7,369 0 0
Handyside & Co.	7,347 1 9
Atlas Iron Works	6,952 0 0
Farrell	6,614 0 0
Stap	6,148 0 0
Wade, Bros. (accepted)	5,835 5 0

For alteration of premises in Leadenhall-street, for Mr. J. Quosbarth. Mr. Joseph Gibson, architect. Quantities supplied:—

Palmer	£797 0 0
Cole	789 0 0
Bennett	764 0 0
Young	748 0 0

For rebuilding the Black Bull public-house, Stoke Newington. Mr. James Harrison, architect. Quantities supplied by Mr. John Leaning:—

Little	£1,621 0 0
Roberts	1,585 0 0
Ashby & Sons	1,546 0 0
Perry & Co.	1,475 0 0
Browne & Robinson	1,467 0 0
Coleman	1,459 0 0
Ennor	1,421 0 0

For warehouse for Messrs. Farnham, City-road. Mr. William Reddall, architect:—

Perry, Bros.	£853 0 0
Axford & Whillier	798 0 0
Kiddle	780 0 0
Browne & Robinson	770 0 0
Eaton & Chapman	694 0 0

For Wednesbury Town-hall. Messrs. Loxton, Bros., architects:—

		Reduced.
Brewer	£3,790 0 0	£3,114 0 0
James Wilkes	3,730 0 0	3,119 10 11
Round & Bagnall	3,576 0 0	3,010 0 0
Stephenson	3,560 0 0	2,912 0 0
Briley	3,555 0 0	2,808 0 0
Whittome	3,485 0 0	2,801 19 9
Pugh	3,379 0 0	2,813 3 5
Chappelle	3,300 0 0	2,700 0 0
Stockton & Son	3,213 0 0	2,621 3 10½
Job Wilkes	3,149 0 0	2,655 0 0
Moore	2,900 0 0	2,361 0 0
Moore (further reduced and accepted)		2,325 0 0

For a vicarage-house and stabling, at Kinver, near Stourbridge. Mr. T. Smith, architect. Quantities not supplied:—

Everal	£1,785 0 0
Bennett	1,700 0 0
Phillips	1,580 0 0
Binnian & Son	1,485 0 0
Horton	1,478 0 0
Hughes	1,420 0 0

For roads at Morden:—

Bull	£3,450 0 0
Clark	2,279 6 10
Pizzey	2,234 10 0
Riley	2,116 0 0
Carter	2,100 0 0
Holmes	2,058 15 0

TO CORRESPONDENTS.

W. A. D. (reply has been sent).—T. M. (it is not settled).—T. R. & Son (our list is official).—J. B. C. (makes the mistake of confounding "moulding" (casting) with mouldings).—F. B.—S. S.—R.—M. G.—G. P.—A. H.—J. H.—J. P. B.—B. L.—J. G.—J. K.—J. H.—J. N.—A. B.—W. P.—R. C.—R. E. W.—F. B.—W. R.—W. W.

We are compelled to decline pointing out books and giving addresses.

All statements of facts, lists of Tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors.

SPECIAL NOTICES.

In consequence of the Reduction in the Newspaper Postage, Subscribers within the United Kingdom can now be supplied with THE BUILDER *direct from the Office, at the rate of Nineteen Shillings per annum,* PAYABLE IN ADVANCE.

We gave with our last Number, as a supplement, an INDEX and Title-page to the Volume of last year. A COLOURED TITLE-PAGE can be had, Gratis, on personal application.

The TWENTY-EIGHTH VOLUME of "THE BUILDER" (bound), for the year 1870, *is now ready, price One Guinea. Also,*

CLOTH CASES for binding the Numbers, price Two Shillings and Ninepence each.

SUBSCRIBERS' VOLUMES, on being sent to the Office, will be bound at a cost of Three Shillings and Sixpence each.

TURNER & ALLEN,

ART FOUNDERS AND ENGINEERS,

201, UPPER THAMES STREET, LONDON, E.C.

MANUFACTURERS OF

LAMP PILLARS, GAS LAMPS, FOUNTAINS, GATES, RAILING, ETC.

Either Plain or Bronzed, in the Highest Style of Art.

HOT-WATER AND GAS ENGINEERS.

Sole Importers of BARBEZÂT'S FRENCH IRONWORK, and Publishers of French and English Books of Design, 2 vols. Price 25s.

Just published, crown 8vo. 208 pp. cloth, price 5s.

SIGN WRITING and GLASS EMBOSSING: a complete Practical Illustrated Manual of the Art. By JAMES CALLINGHAM.

London: SIMPKIN, MARSHALL, & CO. Stationers'-hall-court; and BRODIE & MIDDLETON, Artists' Colourmen, 79, Long Acre.

Lately published, royal 4to. ornamental cloth, price 1*l.* 16s.

ENGLISH COUNTRY HOUSES. FORTY-FIVE VIEWS and PLANS of recently-erected Mansions, Private Residences, Parsonage-houses, Farm-houses, Lodges, and Cottages; with the Actual Cost of each, and a PRACTICAL TREATISE on HOUSE-BUILDING. By WILLIAM WILKINSON, Architect, Oxford. Oxford and London: JAMES PARKER & CO.

LIFE OF BRUNEL, THE ENGINEER. In One Volume, 8vo, with Portrait, 5 Plates, and 22 Woodcut Illustrations, price 21s. cloth.

THE LIFE of ISAMBARD KINGDOM BRUNEL, Civil Engineer. By ISAMBARD BRUNEL, B.C.L. of Lincoln's-inn, Chancellor of the Diocese of Ely.

"A contribution of no ordinary value to our professional literature."—*Builder.*

"To civil engineers, this Life is fraught with instruction, while the general public will find in it many things of no common interest."—*Daily News.*

"Isambard Kingdom Brunel, whose works are railways, bridges, viaducts, and steamships, is well entitled to the exhaustive biography in which his son records the incidents of his father's life, and catalogues and explains his professional achievements."—*Westminster Review.*

London: LONGMANS, GREEN, & CO. Paternoster-row.

PERFECTION in BOOKKEEPING.—BUILDERS and Others desiring a really good system, can have a set of MODELS for BUILDERS' BOOKS, by DOUBLE ENTRY, to which was awarded the prize offered in "The Builder," No. 1,180, and which has been adopted by many large firms. Also a Modified Arrangement by Single Entry, suitable for small builders.—Address, E. A. 4, St. George's-road, Regent's Park, London.

DOULTON & CO.

Beg to call the attention of BUILDERS, PLUMBERS, and OTHERS, to the addition they have now made to their other Manufactures, of SUPERIOR

STAFFORDSHIRE SANITARY WARE,

CABINET STANDS, PLUG BASINS, PAN BASINS, URINALS,

And all other kinds of Plain White, Blue Printed, Marble, and White and Gold Sanitary Ware.

May be seen at their SHOW-ROOMS, HIGH STREET, LAMBETH; and Price Lists had on Application.

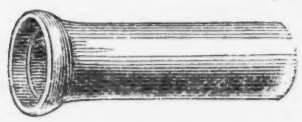
Manufactories:—HIGH STREET, LAMBETH; ROWLEY REGIS; and SMETHWICK, STAFFORDSHIRE.
May also be had at their Depôts,—CROWN WHARF, VICTORIA PARK, E.; GRANVILLE STREET WHARF, BIRMINGHAM; SOHO STREET, LIVERPOOL; and HOPE STREET, SALFORD, MANCHESTER.

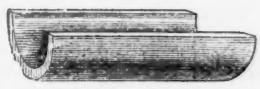
BLUE STAFFORDSHIRE WARE,

DIRECT to ANY PART of the COUNTRY, put into BOATS at the WORKS at Rowley, or into TRUCKS at the RAILWAY STATIONS adjoining.

DOULTON'S STONEWARE PIPES.

PIPES FOR DRAINAGE,
From 2 in. to 30 in. in diameter.





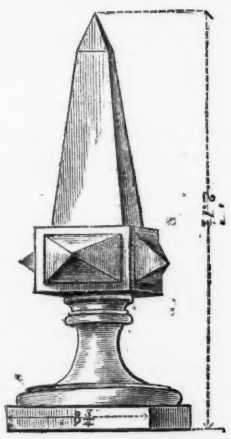
CARRIERS FOR SEWAGE, &c.
With or without Sockets.

DOULTON'S ARCHITECTURAL TERRA COTTA.

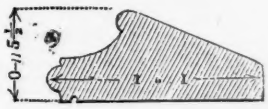
Messrs. DOULTON & CO. are now paying special attention to this branch of their Manufacture, and invite Architects and Builders to view their STOCK at LAMBETH. Specimens also on view at the Crystal Palace; and at the Architectural Museum, Conduit-street, W.

TERRA-COTTA of EVERY KIND MANUFACTURED by DOULTON & CO.

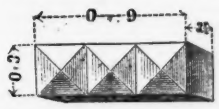
TERMINAL.



WALL COPING.



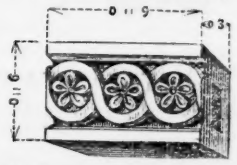
DENTAL COURSE.



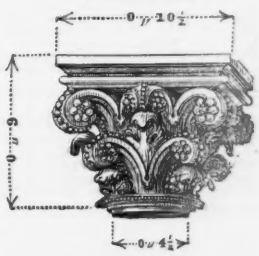
DOG'S TOOTH COURSE.

KEY STONE.

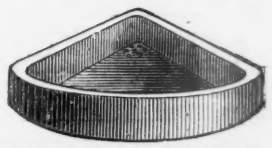
STRING COURSE.



CAPITAL.



STONEWARE SINK.



DOULTON'S PATENT INVERT AND JUNCTION BLOCKS,

And IMPROVED STREET and YARD GULLIES.

DUTCH TILES; RED, BLUE, and BUFF PAVING TILES; AIR BRICKS; DAMP PROOF COURSE, &c.

STONEWARE SINKS, highly Glazed, of great Strength, Incorrosive and Non-absorbent.

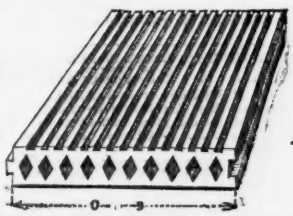
ALL KINDS OF SANITARY WARE.

Fire-clay Goods of all kinds. Plumbago and other Crucibles.

All descriptions of GENERAL STONEWARE, CHEMICAL APPARATUS, FILTERS, AIR-TIGHT JARS, BOTTLES, &c. for Exportation.

DOULTON'S

IMPROVED DAMP PROOF COURSE.



SEE SEPARATE ADVERTISEMENT.

SEPARATE LISTS OF PRICES ON APPLICATION.

THE QUARTERLY REVIEW, No. 259,
is published THIS DAY.
CONTENTS.
I. OUR NATIONAL DEFENCES.
II. MODERN WHIST.
III. COUNT BISMARCK, PRUSSIA, AND PAN-TEUTONISM.
IV. REVENUES OF INDIA.
V. INVASION OF FRANCE.
VI. THE IRISH LORD CHANCELLORS.
VII. CATHEDRAL LIFE AND WORK.
VIII. FRENCH PATRIOTIC SONGS.
IX. POLITICAL LESSONS OF THE WAR.
JOHN MURRAY, Albemarle-street.

Now ready, No. 1. January, 1871. Price 1s. 6d.
THE QUARTERLY JOURNAL of the AMATEUR MECHANICAL SOCIETY. Honorary Editor, Rev. J. LUKIN.
CONTENTS:—Introduction—Rise and Progress of the Society—Eccentric Turning—Mensuration and Enumeration of the Impalpable and Invisible—Medallion Machine (with Illustrations)—Screw-Blank Machine (with Illustration)—Fancy Turning in Boxwood (with Illustrations)—Breech-loading Firearms.
London: TRUBNER & CO. 8 and 60, Paternoster-row.

Third Edition, complete in One Volume, price 1l. 8s. 6d.
THE PRACTICAL DRAUGHTSMAN'S BOOK of INDUSTRIAL DESIGN; forming a complete Course of Mechanical Engineering, and Architectural Drawing; with Selections from, and Examples of, the most useful and generally employed Mechanism of the day.
By WILLIAM JOHNSON, Assoc. Inst. C.E.
Formerly Editor of the "Practical Mechanic's Journal."
This Volume contains 106 quarto pages of Plate Engravings, about 100 Woodcuts, and 210 pages of Letterpress.
GENERAL CONTENTS.
Drawing Instruments; Linear Drawing; the Study of Projections; on Colouring Drawings; the Intersection and Development of Surfaces, with Applications; the Study and Construction of Toothed Gear; Elementary Principles of Shadows; Application of Shadows to Toothed Gear; the Cutting and Shaping of Masonry; the Study of Machinery, and Sketching; Oblique Projections; Parallel Perspective; Isometrical Projection; True Perspective; Architectural Drawing; Examples of Finished Drawings of Machines, with Descriptions.
London: LONGMANS, GREEN, READER, & DYER.

TEXT-BOOKS OF SCIENCE.
On the 28th instant, in small 8vo. price 3s. 6d. cloth,
ALGEBRA and TRIGONOMETRY.
By the Rev. W. N. GRIFFIN, formerly Tutor of St. John's College, Cambridge. (In the Series of Text-Books of Science, in course of publication, edited by Professor T. M. GOODEVE, M.A.)
London: LONGMANS, GREEN, & CO. Paternoster-row.

On Tuesday, the 31st instant, in One Volume. Crown 8vo. price 7s. 6d. cloth, gilt top, or 14s. bound in tree-calf by Riviere,
STRANGE DWELLINGS; being a Description of the Habitations of Animals, abridged from "Homes without Hands."
By J. G. WOOD, M.A. F.L.S. &c. Author of "Bible Animals," &c.
With a New Frontispiece by J. B. Zwecker, and a Selection of the Original Woodcut Illustrations from Designs by W. F. Keyl and E. Smith.
London: LONGMANS, GREEN, & CO. Paternoster-row.

Royal 8vo. pp. 338, price 7s. 6d. Third Edition.
THE PATENTEE'S MANUAL; being a Treatise on the Law and Practice of Letters Patent, especially intended for the use of Patentees and Inventors.
By JAMES JOHNSON, Barrister-at-Law; and J. HENRY JOHNSON, Assoc. Inst. C.E. Solicitor and Patent Agent.
The call for a Third Edition of this work is conclusive proof that it satisfies a want on the part of Patentees and Inventors, to whom a plain statement of the law bearing upon the subject of Letters Patent for Inventions is obviously a matter of great importance. Whilst the exposition of statues and judicial decisions is expressed in plain and popular language, no sacrifice has been made of legal accuracy, and it will be found that the work contains a concise but ample and strictly correct enunciation of the law, with an examination of the decided cases to the latest date.
London: LONGMANS, Paternoster-row.

MR. ROBERT BRODIE MATHER, Architect and Surveyor, 35, Wigmore-street, Cavendish-square, W. PREPARES SKETCHES, PLANS and SPECIFICATIONS, and PERSPECTIVES for the Profession at strictly moderate charges. Quantities accurately supplied. Appointments may be made as above, and Mr. M. will attend to any commissions with promptness and despatch.

TO ARCHITECTS.
PARTNERSHIP.—An ARCHITECT and SURVEYOR, having a thorough knowledge of estimating and measuring, will be happy to enter into PARTNERSHIP with an Architect in good practice.—Address, 662, Office of "The Builder."

TO ARCHITECTS.
A PARTNER WANTED, owing to illness (300l. premium), to manage a first-class Architectural Practice, in the North of England. Several large works in hand. Equal division of returns.—Apply, in writing, to F.R.I.B.A. Office of "The Builder."

TO ARCHITECTS.
WANTED, COPYING of DRAWINGS (either Tracings or Reproductions). Good, cheap and expeditious execution.—Address, THETA, care of Mr. Wells, 155, Abbey-street, Bermondsey, S.E.

ABERDEEN HARBOUR.—NEW SOUTH BREAKWATER.—A FOREMAN is WANTED to Superintend the Workmen engaged in Constructing the New South Breakwater at Aberdeen. He must have experience in the management of workmen, in the construction of breakwaters built of concrete blocks, and in diving operations. A house, rent free, will be provided for him on the works, in which he will have to reside. Wages, 3l. 10s. per week.—Applications and testimonials to be lodged with W. D. KAY, Harbour Engineer, 72, Waterloo Quay, Aberdeen, on or before FRIDAY, FEB. 10, 1871. The successful applicant will have to commence his duties immediately on being selected.

BRADFORD CORPORATION.—WANTED, in the Office of the Borough Surveyor, THREE CLERKS, duly qualified as Surveyors, to carry out private Improvement Works of Drainage and Street-making, under the Public Health Acts. Salary, 100l. per annum each.—Applications, accompanied with testimonials, stating age of applicant, and endorsed "Application, Clerk," to be sent to me on or before MONDAY, the 30th inst.
By order, CHARLES GOTT, Borough Surveyor and Waterworks Manager.
Corporation Offices, Swaine-street, Bradford,
January 14th, 1871.

BOROUGH of HANLEY. — The Town Council of this Borough require the immediate SERVICES of a Gentleman, from 30 to 45 years of age, qualified to act as BOROUGH ENGINEER and SURVEYOR. A list of the duties of the office may be obtained on application to the Town Clerk. Salary 500l. a year, with an annual increase of 10l. up to 250l. An Assistant Surveyor is provided by the Town Council. The Gentleman elected will be required to devote his whole time to the duties of the office, and will not to allowed to engage in or take any other office, occupation, or employment. He may take pupils subject to the approval of the Town Council. Any candidate canvassing the members of the Town Council will be disqualified. Applications (with testimonials as to character and efficiency) must be sent to me on or before the 30th inst. in an envelope marked, "Application for Borough Surveyor's Office."
MATT. F. BLAKISTON, Town Clerk.
Borough Offices, Hanley, January 18th, 1871.

AN ARCHITECT will have a VACANCY for an IMPROVER in March next, at a small salary. State terms, qualifications, and forward specimens of draughtsmanship to JAMES HIBBERT, 19, Fishergate, Preston, Lancashire.

OXFORD LOCAL BOARD.—The Board, at their meeting to be held at the Town-hall, in Oxford, on the 31st day of JANUARY instant, will proceed to the APPOINTMENT of a SURVEYOR, who will also be the Inspector of Nuisances, in the room of Mr. Thomas Charles Clarke, resigned. The Surveyor will have to provide, at his own expense, an Assistant Inspector, subject to the approval of the Board, and such other sufficient staff as shall be required for the efficient performance of the two offices. The salary will be 320l. a year; viz., 260l. as Surveyor, and 60l. as Inspector; and an allowance will be made of 20l. a year towards the rent of an office, which must be situate in some central part of the city to be approved by the Board. The Surveyor will be required to devote the whole of his time to the service of the Board, and to fulfil the duties of the two offices, as set forth in the bye-laws of the Board, and to enter into a written engagement that he will, on no account whatever, undertake any other work. He will also be subject to such further regulations as the Board may from time to time see fit to make. The Surveyor will be required to enter on the duties of his offices as soon as possible after his appointment. Applications, in writing, with testimonials and references, are to be delivered (post free) at the Office of the Clerk to the Board, No. 1A, St. Giles, Oxford, on or before SATURDAY, the 28th of JANUARY instant, endorsed, "Application for Office of Surveyor."
FREDERICK J. MORRELL, Clerk to the Board.
8A, St. Giles, Oxford, January 12th, 1871.

TO PLUMBERS.
WANTED, a thoroughly practical Man. Those only need apply who are competent, and can give good references. WANTED, also, an APPRENTICE (out-door).—Apply in each case, by letter only, with particulars, to J. R. JACKSON, 203, Ebury-street, Pimlico, S.W.

WANTED, immediately, for a short time, THREE JUNIOR ASSISTANTS. Must trace and print well.—Apply, with specimens, between Ten and Eleven any morning to Mr. T. W. ALDWINCKLE, 12, Sise-lane, Queen Victoria-street.

WANTED, in a London Builder's Office, a CLERK accustomed to the usual duties. Must have unexceptionable references as to character, &c.—Address, by letter only, stating age, salary required, and where last employed, to No. 654, Office of "The Builder."

TO BRICKMAKERS.
WANTED, TWO good MOULDERS, for RED BRICKS. Suffolk or Norfolk men preferred. None need apply without good testimonials as to ability and sobriety.—Apply to A. FRASER, Manager, Morden Brick Works, Surrey.

WANTED, in a Surveyor's Office, a YOUTH, who is quick at figures and can write well.—Address, in own handwriting, to X. 3, Park-prospect, Westminster.

WANTED, a thoroughly competent MANAGER of a MACHINE BRICKWORK, in North Wales.—Application to be addressed, B. B. Office of "The Builder."

TO ARCHITECTS AND SURVEYORS.
WANTED, by a well-qualified ASSISTANT, a RE-ENGAGEMENT. Neat and expeditious draughtsman. Design, land surveying, levelling, &c.—Address, J. W. 3, Wellesley-terrace, Upper-street, Islington, N.

WANTED, a first-class DESIGNER, EMBOSSER, HERALD PAINTER, and GLASS WORKER generally, for a permanency; also
A VERY RESPECTABLE LAD as APPRENTICE to the GLASS and SIGN-WRITING, PAINTING, GILDING, and DECORATING. Apply to J. PIKE, Decorator, 93, Wigmore-street, W.

WANTED, by the LIMMER ASPHALTE COMPANY, 63, Mark-lane, a GENTLEMAN, well acquainted with Architects and Contractors, to Attend to and Solicit Orders. Salary and commission.—Applications in writing, with full particulars, to above address.

WANTED, by a JUNIOR CLERK, a SITUATION in a London Architect's Office. Is a neat and quick draughtsman. Can be highly recommended. Terms, 1l. 10s. per week for a permanency.—Address, 620, Office of "The Builder."

TO TIMBER MERCHANTS
WANTED, a SITUATION as TRAVELLER, SALESMAN, or OVERLOOKER, in a Timber-Yard. Understands both English and foreign trades. Has been accustomed to buying, and the management of a saw-mill, &c. Security if required.—Address, A. B. Post-office, Boroughbridge

TO MASONS AND OTHERS.
WANTED, by a good GENERAL STONE and MARBLE MASON, a SITUATION as JOBBING HAND, or Take Charge of a Business or Job.—Address, X. Y. Hanson, 74, Regent-street, S.W.

TO STONEWARE POTTERY PROPRIETORS, &c.
WANTED, a RE-ENGAGEMENT, by a Young Man, aged 32. Thoroughly understands the Mixing of Clays and Glazes. Seven years in last engagement. Country preferred.—Address, B J. H. Office of "The Builder."

WANTED, a SITUATION, as FOREMAN of BRICKLAYERS, or the Labour of Brickwork by the Rod. Good references.—Address, D. T. 11, Fairfoot-road, Campbell-road, Bow, E.

TIMBER TRADE.
WANTED, by an energetic and thoroughly competent Man, a SITUATION as FOREMAN or SALESMAN, or to Take the Entire Management of a Timber Yard. Many years' experience. First-class references.—Address, G. T. M. Post-office, Bow-road.

TO BUILDERS, CONTRACTORS, AND OTHERS.
WANTED, by a thoroughly practical BRICKMAKER, a JOB, to DIG, MAKE, and BURN KILN or CLAMP BRICKS. Labour only, or otherwise. Well acquainted with all kinds of clay. Several years' reference.—Address, G. L. 2, Norfolk-cottages, Freemasons-road, Croydon.

TO PLUMBERS AND BUILDERS.
WANTED, by a Young Man, a SITUATION as PLUMBER, GLAZIER, and PAINTER, where he could improve in plumbing. Wages not such an object as a permanency.—Address, S. H. Maxwell Cottage, Maxwell-road, Fulham, London.

TO CIVIL ENGINEERS, LOCAL BOARDS, AND OTHERS.
WANTED, a RE-ENGAGEMENT, as CLERK of WORKS, or as GENERAL MANAGER, by a thoroughly practical Man (bricklayer by trade). Well up in surveying, drainage of towns, river embankments, tunnelling, and heavy building operations.—Address, J. A. 24, Herbert-street Hoxton, London, N.

WANTED, PAVING, FOOT or CARRIAGE WAY, KERB SETTING, or GRANITE DRESSING, to take by the piece, by a first-class practical Man, of twenty-five years' experience under Dock, Railway, Metropolitan Boards, and Government engineers. One trial.—Address, JAMES CRUTCHLEY, No. 7, James-place North-street, Poplar.

WANTED, as CLERK of WORKS, or FOREMAN, a SITUATION. Has been both. Thoroughly practical with unexceptionable references. Joiner by trade.—Address, A. P. 13, Moorgate-street, City.

TO CARPENTERS, BUILDERS, &c.
WANTED, EMPLOYMENT, by a respectable Young Man, as IMPROVER, at the Bench. Has had five years' experience at the trade. Wages moderate.—Address, G. M Post-office, Slough, Bucks.

WANTED, a SITUATION as CARPENTER, in a manufactory, or on an estate. Aged 26. Highest references.—Address, H. H. 2, Britannia-terrace, Leyton-stone-road.

TO ARCHITECTS.
WANTED, a SITUATION, by an experienced CLERK of WORKS, about to be disengaged. Good references and testimonials.—Address, C. E. Library, 14, Palace-road, Stangate, Lambeth.

TO BUILDERS AND CONTRACTORS.
WANTED, by an efficient BUILDER'S ASSISTANT, aged 31, a SITUATION, as CLERK or MANAGER. Can prepare drawings and specifications, take out quantities, measure and estimate. Is also accustomed to out-door superintendence and office routine.—Address, J. B. 32, College-place, Chelsea, S.W.

WANTED, BRICKWORK, or SLATING and PLASTERING, by Measure or otherwise, or Repairs, by an experienced hand. Labour only.—Address, W. H. 40, John-street, Old Kent-road, by Bricklayers' Arms.

TO BUILDERS, &c.
WANTED, a RE-ENGAGEMENT, as BUILDER'S CLERK. A little drawing. Aged 26.—Address, W. A. G. 55, Park-walk, Chelsea, S.W.

WANTED, by an active Man, thoroughly conversant with every branch of the Building Trade, a SITUATION as MANAGER. Town or country.—Address, 683, Office of "The Builder."

TO ARCHITECTS AND OTHERS.
WANTED, by the Advertiser, a RE-ENGAGEMENT as CLERK or JUNIOR ASSISTANT. Fair draughtsman and colourist. Salary moderate.—Address, A. 147, Marylebone-road, N.W.

TO CIVIL ENGINEERS, CONTRACTORS, AND OTHERS.
WANTED, by a Young Man, aged 17, an ENGAGEMENT, with an Engineer or Contractor. He can survey, take levels, draw plans, and assist on engineering works generally.—Address, C. G. Post-office, Woburn, Beds.

WANTED, a RE-ENGAGEMENT, as GENERAL FOREMAN, or to Take Charge of a Job. Town or country. First-class references. Terms moderate.—Address, J. N. 62, Davies-street, Berkeley-square, W.

TO BUILDERS AND OTHERS.
WANTED, a SITUATION, as WORKING FOREMAN of CARPENTERS. Well experienced.—Address, A. B. No. 13, New King's-road, Eelbrook, Fulham.

WANTED, by a steady Man, a SITUATION, as GAS-FITTER and BRASS-FINISHER. Good references. Town, country, or abroad.—A. B. 11, Holland-villas-road, Kensington.

TO BUILDERS, ESTATE AGENTS, &c.
WANTED, by the Advertiser, who is a good GLASS-CUTTER and GLAZIER, and thoroughly experienced in the various branches of painting and paperhanging, PIECE-WORK, at low prices; or to Manage a Business, having been in business eight years for himself.—Address, B. C. 99, Penton-place, Kennington Park-road, S.E.

TO BUILDERS AND CONTRACTORS.
WANTED, an ENGAGEMENT, by a thoroughly competent CLERK. Well up in the routine of the office, preparation of plans, taking out quantities, estimating, measuring up work, prime cost, &c. Practically acquainted with the trade.—Address, No. 609, Office of "The Builder."

WANTED, a RE-ENGAGEMENT as SHOP FOREMAN, OUT-DOOR FOREMAN, or CLERK of WORKS, by a thoroughly practical London Builder's Foreman. Joiner and staircase hand by trade. Age 34. Good draughtsman and well up in piecework, and machinery of all kinds. No objection to fill up time in the Office, or at the bench. First-class testimonials from London builders.—Address, H. K. 34, Winford-road, Barnsbury, N.

TO BUILDERS AND DECORATORS.
WANTED, a RE-ENGAGEMENT, as MANAGING FOREMAN of PAINTERS and DECORATORS. Can do graining and writing, &c. if required. Good references. Aged 38.—Address, B. YOUNG, 186, Vauxhall Bridge-road, Pimlico, London.

WANTED, by the Advertiser, aged 29, a SITUATION in a JOBBING BUILDER'S OFFICE, Willing to make himself useful. Several years' experience. Country preferred.—Address, J. M. K. 27, Convent-gardens, Kensington Park-road.

WANTED, a RE-ENGAGEMENT, by a practical GENERAL FOREMAN. Carpenter and Joiner by trade. No objection to the country or abroad. Good references from last employers.—Address, 627, Office of "The Builder."

TO ARCHITECTS, SURVEYORS, BUILDERS, AND OTHERS.
WANTED, an ENGAGEMENT, temporary or occasionally, by a first-class QUANTITY TAKER, MEASURER, ESTIMATOR, and DRAUGHTSMAN. Aged 30. Highest testimonials. Terms moderate.—Address, SURVEYOR, 91, Charrington-street, Camden-town, N.W.

TO BUILDERS AND HOUSE AGENTS.
WANTED, EMPLOYMENT, by an active, experienced Man. Aged 32. Joiner and Carpenter by trade. Used to general alterations and house repairs, shop and office fittings, could act as timekeeper or collector of rents. Good scholar. Low wages accepted.—Address, L. H. 1, Carlton-road South, Globe-road, Mile-end, E.

WANTED, by an experienced and energetic Tradesman, a Person having from 200l. to 500l. CASH, to assist in carrying out lucrative Contract Work in hand.—Address, X M X. 53, Lant-street, Southwark.

TO ARCHITECTS AND SURVEYORS.
WANTED, a RE-ENGAGEMENT, by a Young Man. Is a neat DRAUGHTSMAN. Understands perspective, can prepare drawings from rough sketches, and assist in taking out quantities.—Address, R. S. 34, Alfred-street, Westbourne-road, Barnsbury, N.

TO ARCHITECTS, BUILDERS, &c.
WANTED, an ENGAGEMENT, temporary or otherwise, by a first-class ESTIMATING and QUANTITY CLERK. Good practical draughtsman, and well up in builders accounts; 22 years' experience; 7 years with last employer. Address, R. E. 303, Gray's-inn-road.